CALIFORNIA
OIL WORLD
and Petroleum Industry

PUBLISHED TWICE A MONTH — ENGINEERING — TECHNOLOGY — LATEST NEWS

SECOND ISSUE
MARCH 1941
VOL. 34 NO. 6
WHOLE NO. 1581

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To combine in one location all the facilities of its scouting, editorial, draughting and photographic departments, California Oil World, effective April 1, will be established in larger quarters in the 939 South Broadway Building.

This unification of facilities will prove of particular benefit to the many readers of California Oil World whose practice it has been to visit the publication's offices in quest of information and other services. The increased accessibility of the California Oil World's services should make the publication's offices more than ever the Clearing House for California oil men.

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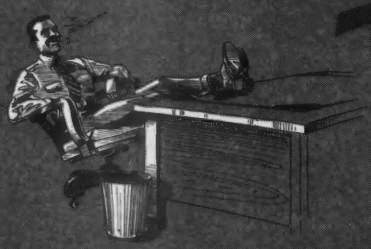
California Oil World and Petroleum Industry is published twice a month at 828 Petroleum Bldg., 714 West Olympic Blvd., Los Angeles, California. Entered as Second-class Matter January 1, 1937, at the post office at Los Angeles, California, under the Act of March 3, 1879. Subscription price $1 per year in U. S. and Possessions, $2 in foreign countries, including Canada. Member of the Audit Bureau of Circulations.

March 25, 1941

Telephone Number Richmond 2136



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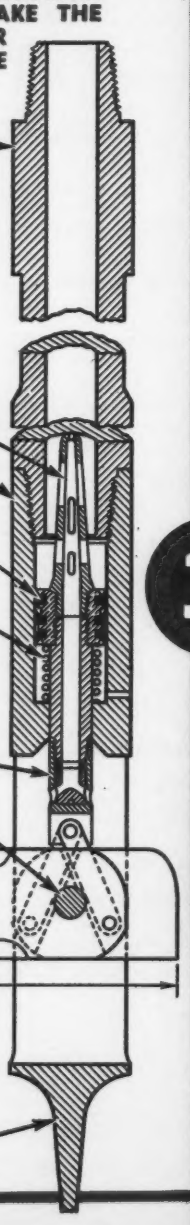

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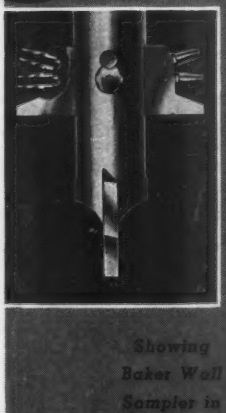
2 TOOLS IN



Showing Baker Wall Sampler in Operation

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Development of Miocene Production

in the Inglewood Field

By W. E. Dunlap, Consultant

Since reporting in the Second Issue, April, 1940, of California Oil World on the possibilities of Miocene production in the Inglewood Field, much valuable information has been obtained by the drilling and completion of two deep wells in the field. The R. R. Bush Oil Company completed their Sentous No. 1 well at a depth of 8760 feet. The location of the well is in the Northwest Quarter (NW¼) of Section 17, Township 2 South, Range 14 West. The top of the Miocene was encountered at approximately 7350 feet. The 7-inch casing was cemented at 8325 feet and 461 feet of 5½" including 440 feet of perforated was landed at 8759 feet. The well was completed on September 6th, 1940, with a reported initial production of 360 barrels per day of 30.5° gravity oil. Various reports indicate that the well on a formation test produced at the rate of 700 barrels per day. Considerable trouble was encountered because of tremendous gas pressure while drilling the well below 8300 feet, and, no doubt the small initial production is due either to some mechanical problem or to relatively low local permeability or both.

The location of the well is rather low structurally but nevertheless the results thoroughly demonstrated that commercial production could be found in the lower Miocene measures.

Perhaps the most outstanding completion of the year was Federal Oil Company's Smith Well No. 1, located in the same field, approximately 1¼ miles in a Northwest direction from the Bush well, along the Northwesterly plunge of the Inglewood anticline. The well was completed on March 5, 1941, at a depth of 8341 feet. The 7-inch water string was cemented at 7920 feet. The interval from the 7-inch shoe to bottom was all perforated. The well came in flowing at the rate of 80 barrels per hour of 31 plus gravity oil, through a 95/64-inch bean. The pressure on the casing with the above size bean was 1150 pounds and the tubing pressure 900 pounds.

W. E. Dunlap

The estimated production of gas was over 2,500,000 cubic feet. A test for gasoline content showed 2.7 gallons per thousand cubic feet. After 24 hours the production built up to 2200 barrels daily. After 36 hours the well was gradually beaned back to a 7/64-inch bean; the pressure on the tubing increased to 1965 pounds and on casing 3150 pounds. The production was approximately 540 barrels per day of 32.4 gravity oil cutting less than 1%. At the present writing (March 22, 1941) the production and pressure remain practically the same, indicating that there is a large amount of shut-in reserve.

The top of the Miocene here was encountered at 6970 feet, indicating that the well is approximately 302 feet structurally higher than the Bush Sentous No. 1.

The Smith well was started long before the Bush Sentous No. 1 was spudded in; cores taken in Smith No. 1 from 5500 feet to as deep as 6700 feet indicated that the beds were dipping at approximately 50 degrees, and it was not until the top of the Miocene was reached that the cores showed a flatter dip. Towards the bottom of the hole the dips decreased to around 20 degrees.

It is the writer's opinion that intense folding took place in lower Pliocene times, which resulted in the steep beds shown by the cores. A study of the electric log run on the old Plymouth Oil Company's Pollard Well, which is located approximately 400 feet South of the Smith Well, together with the points observed on the electric log run in the Federal Well, show that the beds increase in dip to the North with depth.

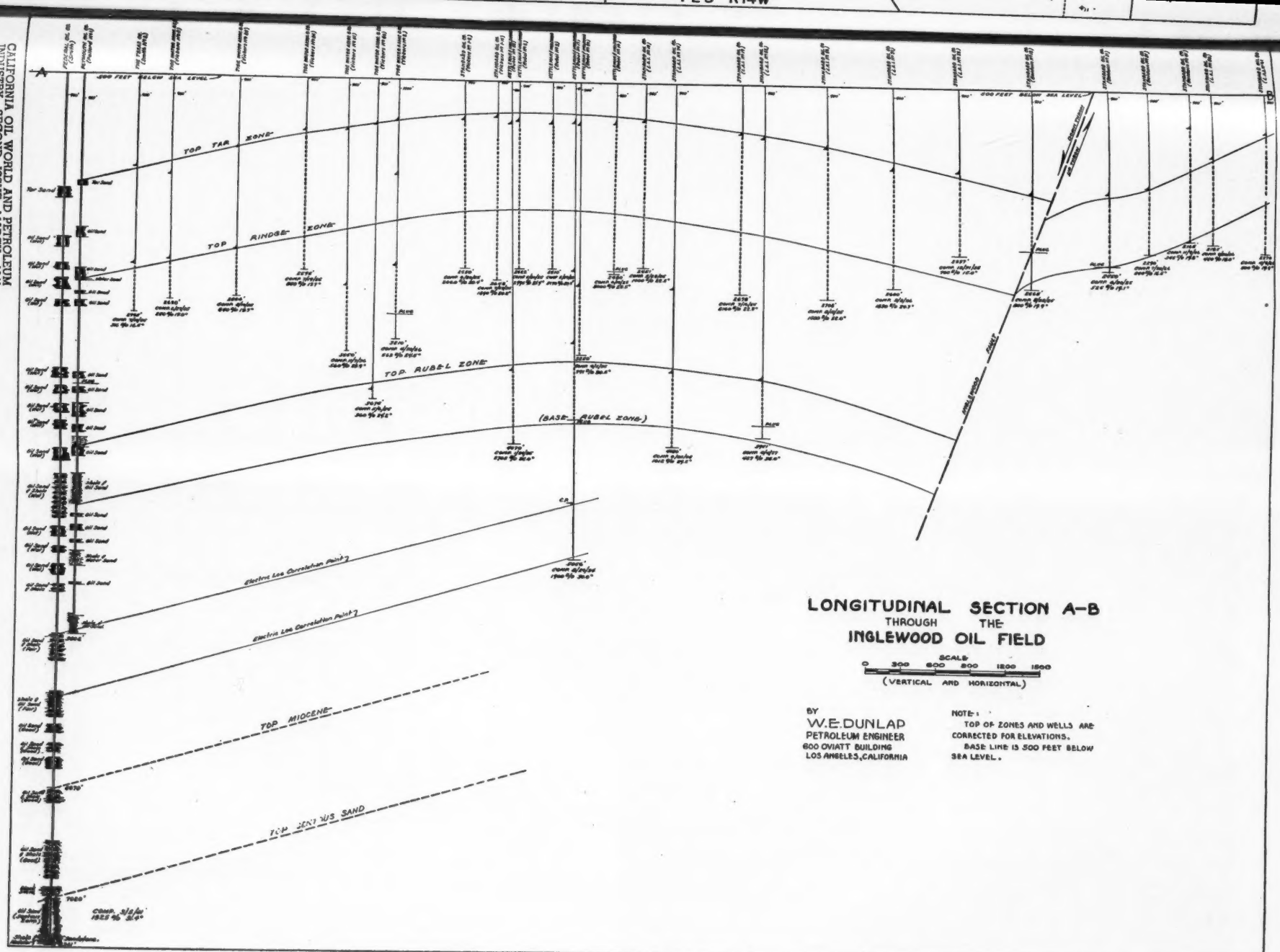
The old records of the Pollard well indicate that the top of the Miocene was encountered at 5570 feet, and it was because of this fact that the writer fully expected that the top of the Miocene would be found at approximately 5650 feet in the Smith Well. It is now almost certain that the Miocene point is not at 5570 feet in the Pollard Well, and it is also quite certain that the top of the Miocene in the Kettleman and Inglewood Corporation's Rubel #17 is not at 5052 feet, which was reported in the record. The accompanying revised section shows several correlative points between the two wells taken from electric logs and foraminifera determinations considerably above Miocene contact.

The question now is: "What is the significance of the steep dips found in the cores of the lower Pliocene beds in the Federal Well?" There are two possible answers:

The first one is: the Pliocene beds are steep along the Northwest plunge and gradually flatten out as the Miocene contact is approached. One thing is certain and that is that the cores taken in the Miocene beds are much flatter than those found in the younger Pliocene beds.

The second answer is that a cross fault running almost east and west

CALIFORNIA OIL WORLD Map of INGLEWOOD
SCALE 0 250 500 1000 2500 FT.
DEEP ZONE WELLS
INGLEWOOD FAULT
SHELL OIL COMPANY (Mayer)
STANDARD OIL COMPANY OF CALIFORNIA (L.A. Investment)
STANDARD OIL COMPANY (Vickers One)
(Vickers Two)
STANDARD OIL COMPANY OF CALIFORNIA
(Baldwin-Clendge)
(Stocker)
STD. OIL CO. OF TEXAS FORMERLY A.S.I. CORP. (Cone)
THE TEXAS COMPANY (Hoyser)
TIDE WATER ASSOCIATED OIL CO.
BALDWIN OIL CO.
R.R. BUSH OIL CO.
FEDERAL OIL CO.
HOGAN PETROLEUM CO. (Hoover)
O.R. HOWARD
METRO-GOLDWYN MAYER
CITY OF LOS ANGELES
THE TEXAS CO. (Pacific Mutual Company)
HOGAN PETROLEUM CO. (Roman Catholic Church)
R.R. BUSH OIL CO. (Sentous)
ROMAN CATHOLIC CHURCH
M. UHARRIET
M. MACHADO
(SUBDIVIDED)
STERLING AVE.
BALL OAK CREEK
Right of Way
(OLIVE CITY TOWN LOT AREA)
T2S R14W
T2S R15W
1 6 / 12 7
7 8 / 18 17
8 9 / 17 16
12 7 / 13 18



LONGITUDINAL SECTION A–B
THROUGH THE
INGLEWOOD OIL FIELD

SCALE
0 300 600 900 1200 1500
(VERTICAL AND HORIZONTAL)

BY
W.E. DUNLAP
PETROLEUM ENGINEER
600 OVIATT BUILDING
LOS ANGELES, CALIFORNIA

NOTE:
TOP OF ZONES AND WELLS ARE CORRECTED FOR ELEVATIONS.
BASE LINE IS 500 FEET BELOW SEA LEVEL.

accounts for the steepness of the Pliocene beds. If this cross fault does exist it most surely hades to the south.

It is my candid opinion that several faults will be discovered during the development of the Miocene producing zones in the Inglewood Field, and whether the above cross fault really exists I am not prepared to say at this time, for it will take the completion of several other wells in this immediate area to really determine just what is going on in the lower Miocene beds. One thing I believe is certain, that whether we have cross faults or not some kind of commercial production will be obtained in the upper and lower Miocene beds at almost any location in this immediate area. A study of the electric log run in the Federal Well strongly indicates that some sort of production can be obtained between the intervals of 6400 and 6700 feet, 6970-7050, and 7400 to 7700 feet. All of these intervals are behind the water string and the first interval named above is in the lower Pliocene beds.

The major fault, commonly known as the Inglewood fault, shown on the accompanying map, will probably play some part in the development of the lower zones and since all the properties are more or less held by the larger companies, orderly development of the lower measures will probably prevail.

Engineering, Technology, latest news—twice a month in California Oil World.

UNION OIL COMPANY OF CALIFORNIA
PRICES FOR CURRENT PURCHASES OF CRUDE OIL
EFFECTIVE 7 a.m. MARCH 22, 1941

Price per barrel in fields designated

Gravity	Signal Hill	Wilmington	Huntington Beach	Torrance	Santa Fe Springs	Rosecrans Dominguez	Playa del Rey	East Coyote	Olinda Brea Canyon	Richfield	Montebello	Santa Paula	Gravity
13.5	.....	$ .62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13.5
14.5	$ .70	.65	$ .68	$ .70	.....	.....	.....	$ .66	$ .66	$ .66	$ .67	$ .65	14.5
15.5	.72	.65	.70	.71	.....	.....	.....	.67	.68	.68	.68	.66	15.5
16.5	.74	.....	.72	.72	.....	.....	.....	.68	.70	.70	.69	.67	16.5
17.5	.76	.....	.74	.73	.....	.....	.....	.69	.73	.72	.70	.68	17.5
18.5	.78	.....	.76	.74	.....	.....	$ .70	.70	.76	.74	.71	.69	18.5
19.5	.80	.....	.78	.76	.....	.....	.72	.72	.79	.76	.72	.70	19.5
20.5	.82	.....	.81	.78	.....	.....	.75	.74	.81	.78	.73	.71	20.5
21.5	.84	.....	.84	.80	.....	.....	.78	.77	.84	.80	.75	.72	21.5
22.5	.87	.....	.87	.82	.....	.....	.82	.80	.87	.82	.77	.74	22.5
23.5	.90	.....	.90	.86	.....	.....	.86	.83	.90	.84	.79	.76	23.5
24.5	.93	.....	.93	.89	.....	.....	.90	.86	.93	.86	.81	.79	24.5
25.5	.96	.....	.96	.93	.....	.....	.94	.90	.96	.89	.82	.82	25.5
26.5	.99	.....	.99	.96	.....	.....	.98	.94	.99	.92	.84	.85	26.5
27.5	1.02	.....	1.02	1.00	.....	$ .94	.....	.98	1.02	.95	.89	.88	27.5
28.5	1.04	.....	1.04	1.03	$1.05	.97	.....	.....	1.05	.98	.93	.90	28.5
29.5	1.06	.....	1.06	1.06	1.07	1.00	.....	.....	1.08	1.01	.98	.92	29.5
30.5	1.08	.....	1.08	1.09	1.09	1.03	.....	.....	.....	.....	1.02	.94	30.5
31.5	.....	.....	.....	.....	1.11	1.06	.....	.....	.....	.....	1.07	.96	31.5
32.5	.....	.....	.....	.....	1.13	1.09	.....	.....	.....	.....	1.11	.98	32.5
33.5	.....	.....	.....	.....	1.15	1.12	.....	.....	.....	.....	1.15	1.00	33.5
34.5	.....	.....	.....	.....	1.17	1.15	.....	.....	.....	.....	1.19	1.02	34.5
35.5	.....	.....	.....	.....	1.19	1.18	.....	.....	.....	.....	1.23	1.04	35.5
36.5	.....	.....	.....	.....	1.21	1.21	.....	.....	.....	.....	1.27	1.06	36.5
37.5	.....	.....	.....	.....	.....	1.24	.....	.....	.....	.....	1.30	.....	37.5
38.5	.....	.....	.....	.....	.....	1.27	.....	.....	.....	.....	1.33	.....	38.5
39.5	.....	.....	.....	.....	.....	1.30	.....	.....	.....	.....	1.36	.....	39.5
40.5	.....	.....	.....	.....	.....	1.33	.....	.....	.....	.....	1.39	.....	40.5

Price per barrel in fields designated

Gravity	Santa Maria Valley	Orcutt	Edison Mountain View	Belridge Lost Hills	Elk Hills Buena Vista Hills Midway-Sunset Lake View Area	Coalinga	Kern Front Kern River Mt. Poso McKittrick	Rio Bravo	Coles Levee	Kettleman Hills	Gravity
10.5	$ .40	.....	.....	.....	.....	.....	.....	.....	.....	.....	10.5
11.5	.42	.....	.....	.....	.....	.....	.....	.....	.....	.....	11.5
12.5	.44	.....	.....	.....	$ .61	.....	$ .61	.....	.....	.....	12.5
13.5	.46	.....	.....	$ .63	.63	$ .63	.63	.....	.....	.....	13.5
14.5	.48	.....	$ .65	.65	.65	.65	.65	.....	.....	.....	14.5
15.5	.50	.....	.66	.66	.67	.67	.65	.....	.....	.....	15.5
16.5	.52	$ .65	.67	.67	.69	.69	.65	.....	.....	.....	16.5
17.5	.54	.66	.68	.68	.71	.71	.....	.....	.....	.....	17.5
18.5	.....	.67	.69	.70	.73	.73	.....	.....	.....	.....	18.5
19.5	.....	.68	.70	.72	.76	.76	.....	.....	.....	.....	19.5
20.5	.....	.70	.72	.74	.79	.78	.....	.....	.....	.....	20.5
21.5	.....	.72	.74	.76	.82	.80	.....	.....	.....	.....	21.5
22.5	.....	.74	.76	.78	.85	.82	.....	.....	.....	.....	22.5
23.5	.....	.77	.78	.80	.89	.84	.....	.....	.....	.....	23.5
24.5	.....	.80	.81	.83	.93	.86	.....	.....	.....	.....	24.5
25.5	.....	.83	.84	.85	.97	.88	.....	.....	.....	.....	25.5
26.5	.....	.86	.87	.88	1.01	.90	.....	.....	.....	.....	26.5
27.5	.....	.....	.90	.90	1.05	.92	.....	.....	.....	.....	27.5
28.5	.....	.....	.93	.93	1.09	.94	.....	.....	.....	.....	28.5
29.5	.....	.....	.96	.95	1.12	.96	.....	.....	.....	.....	29.5
30.5	.....	.....	.99	.98	1.15	.98	.....	.....	.....	.....	30.5
31.5	.....	.....	1.02	1.00	.....	1.00	.....	.....	.....	.....	31.5
32.5	.....	.....	.....	1.03	.....	1.02	.....	.....	$1.04	.....	32.5
33.5	.....	.....	.....	1.05	.....	1.04	.....	.....	1.07	$1.04	33.5
34.5	.....	.....	.....	1.07	.....	1.06	.....	.....	1.09	1.07	34.5
35.5	.....	.....	.....	1.10	.....	.....	.....	.....	1.12	1.09	35.5
36.5	.....	.....	.....	1.12	.....	.....	.....	$1.12	1.14	1.11	36.5
37.5	.....	.....	.....	.....	.....	.....	.....	1.14	.....	1.13	37.5
38.5		Payments for crude oil will be made on the basis of the gravity of the						1.16	.....	1.15	38.5
39.5		oil at 60°F., determined in accordance with ASTM Method D287-39 or						1.18	.....	1.17	39.5
40.5		the latest revision thereof, and prices for gravities between those quoted						1.20	.....	1.19	40.5
41.5		will be calculated proportionately to the nearest cent per barrel.						1.22	.....	.....	41.5
42.5								1.24	.....	.....	42.5

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Recently Developed Methods for Inspection of Tubular Goods and Sucker Rods

By H. M. Henderson
Standard Oil Company of California,
La Habra

Presented at the Spring Meeting of the Pacific Coast District A. P. I. Division of Production Los Angeles, California March 11, 1941

This paper describes the general construction, methods of operation and some of the results obtained through the use of recently developed equipment, for the inspection of tubing, drill pipe and sucker rods that have been in service for a period of time.

The constantly decreasing profits obtained from the production of oil has encouraged the development of new equipment to help maintain these profits by further reducing the cost of production.

Material costs constitute one of the main items of production expense and it was mainly in regard to reduction of material costs that the equipment described in this paper was developed. Reduction in quantity of material required by the industry is doubly important at this time for in addition to reduction of production expense, it also releases material and manufacturing facilities to our constantly expanding defense program.

Inspection of Used Oil Well Tubing

While wells are being produced by natural flow or by gas lift, the maintenance of the tubing string offers little or no problem as little if any wear occurs inside the tubing except in rare cases where a large volume of sand is produced with the oil, or where corrosion is a factor. However, when it becomes necessary to pump the well and sucker rods are installed, friction between the inside wall of the tubing and the sucker rod couplings results in a wearing away of the surface of both, the extent depending mainly on the straightness of the hole and to a lesser degree on the character of the fluid produced, pumping speed, etc.

Worn sucker rod couplings are readily detected when the string is pulled and are replaced as the situation requires. Worn joints of tubing are also replaced at times before actual failure occurs, but the detection of worn points is not so easy and a knowledge of the extent of the wear is not so apparent to the well crew as in the case of the sucker rods for it is impossible to determine the amount of the wear and in many cases to even detect the existence of it without special instruments.

It was to improve this situation that the Dia-Loy Tubing Survey instrument was developed. This instrument may be used to survey tubing either on the rack or in the well.

Figure No. 1 shows a diagramatic arrangement of the instrument in a section of tubing and the manner in which it operates to detect the worn spots and the extent of the reduction of wall thickness. The instrument is set, before running into the tubing, to indicate when the remaining wall thickness is **less** than a given amount. For example, if it is set to indicate a remaining wall thickness of less than ⅛ inch, no electrical contact is made unless the remaining wall at any point throughout the length measured is less than this amount. The actual wall thickness may be any amount between ⅛ inch and the full thickness of new pipe if no electrical contact is made. In other words, the instrument only indicates if the remaining wall is **less** than the amount for which the instrument is set.

By re-setting the instrument to indicate other remaining wall thicknesses, tubing may be segregated into different classes and utilized to the most economical advantage.

As is readily apparent, the instrument does not measure the actual wall thickness of the pipe, but indicates the inside diameter opposite each one of the fingers. The remaining wall thickness is determined by comparison of this diameter with the nominal O.D. of the pipe. Commonly used settings of the instrument are for 1/16 inch, 3/32 inch and 1/8 inch remaining wall in order that tubing may be classified sufficiently for proper segregation.

(The author shows the instrument as used to survey tubing on the rack and the instrument as used to survey tubing in the well.) The instruments are alike in principle and similar in construction, the main difference being in the recording of the measurements. When surveying tubing on the rack, an "electrical buzzer" indicates the existence of a worn area, while a strip recorder with pen records the length and depth of worn area in the tubing when a survey is conducted in a well. To determine the length of the worn area in tubing surveyed on the rack, the operator notes the distance the instrument is moved while the buzzer is buzzing.

In order that the entire circumference of the tubing be surveyed without the necessity of rotating the instrument, contact fingers are spaced at ⅜ inch intervals around the circumference of the tool and these will detect a worn spot as small as ⅜ inch in width . . . Measurements are always made when coming out of the hole as greater accuracy is thereby obtained.

In a survey conducted at a well which had caused much trouble from tubing

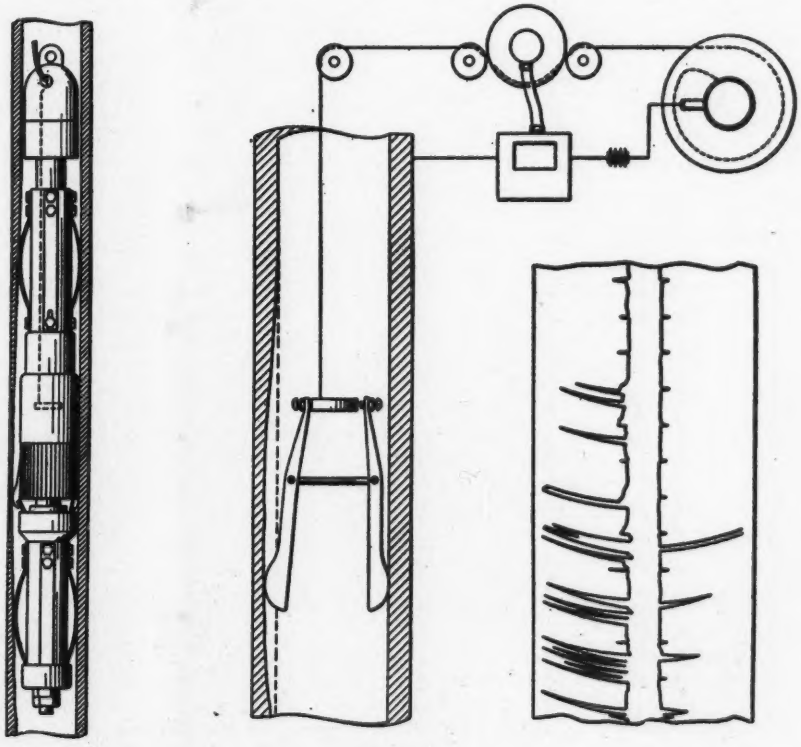


Figure 1

leaks and where conclusions had been reached to replace the string with a new one, it was found that 106 out of 152 joints had a remaining wall of more than ⅛ inch and could be re-run safely while the joints with less remaining wall were replaced with new material. Considerable saving was thus accomplished and a definite knowledge of the existing situation was obtained.

A survey conducted on a rack full of tubing which had been segregated by visual inspection indicated that much good pipe had been segregated as scrap and considerable scrap pipe had been classed as good, indicating that purely visual inspection of worn tubing would probably lead to much expense and trouble due to the improper classification and use.

Inspection of New and Used Sucker Rods

Oil well sucker rods constitute one of the major items in the maintenance of a pumping well. Sucker rods are subjected to severe service and until recently there has been no means of determining where a probable failure was liable to occur hence there was no opportunity of removing the defective rod before failure actually occurred.

It is generally conceded that sucker rod failures are due to "fatigue" of the steel. This fatigue may be caused by concentration of stress at a nick in the rod produced by rough handling, a corrosion pit, a kink in the rod produced in service, or by faulty handling, or by continued excessive overloading of the rod string.

It has never been found possible to correlate the progress of "fatiguing" in any material with the commonly known properties of the material such as tensile strength, charpy impact value, Brinnell hardness, etc., hence it has been impossible to know to what extent the fatiguing has progressed or how to predict the time or place of failure.

Such being the case, the only criterion available for use in the retiring of a string of sucker rods from service or relocating at a well where lighter service was required was "when the number and frequency or failures appeared to be too high to economically continue the string in service at the particular location."

It is generally assumed that the upper rods in a string made up of a single rod diam. will have been fatigued to the greatest degree. This is probably true in the majority of cases as these rods carry the greatest load. However, it is conceivable that such is not always the case due to stress waves set up in the string by the pumping motion and the natural period of stress wave or vibration period of the string.

In removing a string of rods from a well, no method has been available to segregate the rods suitable for further service from those which should be scrapped.

Recently, equipment has been developed by the Magnetest Corp. for the surveying of a string of rods as the rods are being pulled from the well and from the records drawn on the strip chart by the recording instrument, to classify the rods according to the amount of working that the steel has undergone. From the information thus obtained, rods classified as poor are removed from service or relocated at a point of lower loading in the string.

The Magnetest Corporation have done a great deal of work in developing their method and have sorted out rods which they classify as "poor" from strings that have had frequent failures and thereby reduced the frequency of failure. The method appears to have possibilities and it is hoped that it will be fully developed so it can be depended upon to accurately sort out from a string rods that are liable to fail.

The operation of the instrument depends upon the magnetic properties of the material in the sucker rod. The author shows the assembly through which the sucker rods are drawn as they are raised from the well. This assembly contains a group of primary coils which surround the rod and are energized by an electric current drawn from an A.C. motor-generator set mounted on the truck which also carries the recording instruments. A set of "pick-up" coils which surround the rod are also carried in the well head assembly. A voltage is generated in the "pick-up" coils by the magnetic field which is induced in the sucker rod by the energized primary coils and it is the variation in this voltage which is indicated by the recording instrument.

A novel electric arrangement causes the strip chart in the recorder to travel in exact synchronism with the rods, one division on the chart corresponding to one foot of sucker rod, thus the exact location of any condition recorded may be inspected after the rod is laid down.

The recorder technician keeps close watch on the record, keeps instrument properly adjusted, labels chart with type and make of rod surveyed and is in constant contact with an assistant on the derrick floor by means of a 2-way communication system.

A truck carries everything excepting the well head equipment. A set of insulated cables connect the well head assembly to the recording mechanism and electric power to operate the motor-generator is taken from the rig lighting circuit.

The well head assembly is connected directly to the tubing head by suitable nipples and bushings and the rod elevators are set on top of the Magnetest well head assembly. The well crew handling the elevators stand on an elevated steel platform which has suitable safety railings around it.

Since there is no means of checking Magnetest indications by physical tests of the material in the laboratory or otherwise, it remains for the operator to either continue to operate the string of rods until actual failures occur and see for himself if Magnetest predictions have been correct, or, if he has had excessive shutdowns due to failure of the rods, to replace or relocate the rods showing poor condition to determine if the rate of failures decreases.

It is obvious that the second method should prove more practical from an operating standpoint.

Figure No. 2 shows the records of rod failures in a group of wells "before" and "after" removal of rods found to be poor by Magnetest. Operating conditions were constant under both periods of the test.

Figure No. 3 illustrates various new rod characteristics and typical used rod characteristics after fatigue has progressed and failure later occurred, as drawn by the Magnetest recorder.

As shown by these charts, each type and make of rod produces its own characteristic graph, depending upon manufacturing process and analysis of steel used. It is thus evident that proper identity of the rod must be available in order that the chart may be properly interpreted. The lower line on the chart, commonly called the "phase" graph may be considered as a reference line for the upper graph which indicates the condition of the rod. As fatigue progresses in the rod, the upper graph on the chart rises. Experience in surveying the different types and makes of rods permits the Magnetest engineer to estimate the extent to which fatigue has progressed and to recommend future use or disposal of the rod.

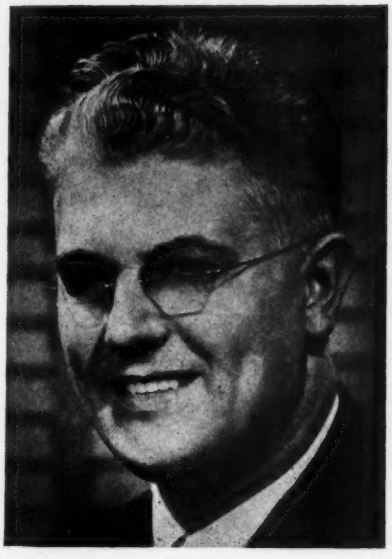
While it is obvious that new sucker rods have not suffered fatigue due to working in a well, many instances have occurred where a new string of rods has given service much below the average to be expected. This had been difficult to understand and a check of all known measurable operating conditions has not offered any solution, in many cases.

(To Be Continued)

Westinghouse Names New Los Angeles Chief

A. E. Hitchner, manager of the Los Angeles office of the Westinghouse Electric & Mfg. Co. since 1926, has been made commercial assistant to the Pacific Coast

A. E. Hitchner



A. J. Bronold

District manager. The appointment was announced recently by Chas. A. Dostal of San Francisco, Pacific Coast District manager.

At the same time, Mr. Dostal named Alan J. Bronold, formerly of Chicago, as manager of the Los Angeles office. Mr. Bronold's appointment will enable Mr. Hitchner to devote his entire time to special sales assignments in the Los Angeles, San Diego, Phoenix and El Paso areas.

A native of Olean, N. Y., Mr. Bronold graduated as an electrical engineer from Bliss Electrical School, Washington, D. C. He joined Westinghouse at East Pittsburgh, Pa., in 1926 as a graduate student. After serving for three years in the central station sales department, Pittsburgh office, he became branch manager for the Westinghouse Lamp Division, first at Columbus, O., then at Grand Rapids, Mich. In 1936 he became special representative for the Lamp Division at Chicago, and in 1939 was named manager of the agency and specialties division for the Northwestern District, with headquarters in Chicago. Mr. and Mrs. Bronold and their 5-year-old daughter will make their home in Los Angeles.

Mr. Hitchner joined Westinghouse in 1909, five years after graduating from Rutgers College as an electrical engineer. After service in Philadelphia, Wilkes Barre and East Pittsburgh, he became Los Angeles manager in 1926.

Pacific Section Geology Bibliography

A group of local geologists and engineers has made a study of oil reservoir conditions and mechanics. Under the auspices of the Pacific Section of the American Association of Petroleum Geologists a number of study groups have been conducting studies on various matters of interest to the petroleum industry.

The group, who addressed themselves to the problems involved in the conditions and mechanics of oil accumulation, has compiled a bibliography of more than three-hundred titles. Members of the group have abstracted these articles, and this data has been reproduced on 4x7 cards, so the information may be filed conveniently. A few copies of this bibliography with abstracts, which to date have been sold only to members of the American Association of Petroleum Geologists, are still available. If interested in obtaining a set of these cards, one may send 65c to H. K. Armstrong, 1002 Edison Building, Los Angeles. This amount covers the cost of reproduction of the bibliography in card form and mailing costs.

Petroleum Forum Launched in Los Angeles

With the election of officers and adoption of by-laws at a luncheon meeting in Los Angeles Mar. 19, the Petroleum Forum was formally launched. The purpose of the new organization is to provide a common meeting ground for the cultivation of better understanding of the problems of the industry and of differing points of view.

Officers elected were: H. B. Duchand of Republic Petroleum Co., president; J. K. Wootan, Sunset Oil Co.; R. A. Broomfield, Jr., Barnsdall Oil Co., and G. S. Follansbee, Universal Consolidated Oil Co., vice presidents; W. A. Weiss, Lloyd Corp., recording secretary; D. P. Murdy, Wilshire Oil Co., corresponding secretary; A. E. Bell, Jr., A. E. Bell Corp., treasurer.

The new group is entirely independent of any other oil industry organization, and its activities will be determined by membership representative of the several sections of the industry. Membership will be by invitation.

The initiative in forming the new group was taken by A. E. Bell, Jr., under whose chairmanship several pre-organization meetings were held at which various men prominent in the industry gave talks on subjects of current interest.

"Bart" W. Gillespie Joins H. & B. Sales

Roy Hitchcock, president of the H. & B. Sales Co. of Long Beach today announced the addition of Bart W. Gillespie to the sales force of the company.

Bart Gillespie

Mr. Gillespie, for years associated both with foreign and domestic sales in the petroleum industry, recently returned to the United States from South America where he had been employed in the petroleum industry in Mexico, Peru and later in the Argentine. His work will be in connection with the sales of Wilson drilling and production equipment manufactured by the Wilson Manufacturing Co. of Wichita Falls, Texas.

Mr. Gillespie left March 14 for the Wilson plant to study their manufacturing and engineering methods as applied to Wilson Drilling Rigs, production hoists and various types of mast designs for both drilling and production.

Nomads Induct 1941 L. A. Officers

The new officers of the Los Angeles Chapter of Nomads were inducted into office at the regular monthly dinner meeting held in Los Angeles, March 13, 1941. The affair was an open meeting with nearly eighty Nomads and guests present and in addition to the induction ceremonies

E. B. Fowks

there were several other important events. Elmer Decker of Martin-Decker Corp. conducted the induction of the new officers who are Ernie Fowks of Emsco Derrick & Equipment Co., president; Bill Bettis of M. O. Johnston Oil Field Service Corp., vice-president; Earl Rees of Oil Well Manufacturing Co., secretary-treasurer; Elmer Smith of Lane-Wells Co., asst. secretary-treasurer; Bob Eiche, sergeant at arms; and Roy Hitchcock, deputy sergeant at arms.

The Charter for the Los Angeles Chapter was presented by Ted Sutter of Baker Oil Tools, Inc. and after the meeting the charter members present signed the parchment. The first Honorary Membership ever conferred by the Nomads was given to J. E. Brantly of Drilling & Exploration Co. for outstanding services rendered to the Nomads by an operator in foreign fields. The presentation of the certificate was made by Frosty Martin of Martin-Decker Corp.

New standing committees were appointed by President Fowks. These were in addition to the Executive Committee which consists by constitution of the officers and the immediate past president of the Chapter, Ted Sutter. The induction and membership committees were combined and consist of Fred Ripley of Emsco, chairman; Roy McCollum of Parkersburg Rig & Reel Co.; and Wallace Sawdon of The Petroleum Engineer. The Entertainment Committee appointed consists of the Sgt. at arms, Bob Eiche; deputy sgt. at arms, Roy Hitchcock; George Trembly of Howard Supply Co.; and Lew Bronzan of Baash-Ross Tool Co.

The speaker of the evening was Louis Chappuis who has recently been doing geological work in Peru and Brazil for some American interests. Being a native of Peru he is familiar with all portions of that country and gave some interesting data on the life of the country outside of the big cities.

Among the guests from foreign fields were Tom J. Downey of Attock Oil Co., Khaur, Punjab, India; A. W. McPherson of Standard Oil Co. of Calif. who was recently in Colombia; Paul B. Sardinha of Drilling & Exploration Co. from Bahia, Brazil; Juan A. Castro of the Y.P.F. from Argentina; T. J. M. Sleeman of Caribbean Petroleum Co., from Venezuela; and Phil Reed of the Richmond Petroleum Co. of Colombia. Also a guest with considerable foreign interest was Ed. Skinner who is in charge of all foreign operations for the Standard Oil Co. of Calif.

Bruce Robinson Elected A. P. I. Production Chairman

Bruce H. Robinson, field superintendent for General Petroleum Corp., has been elected 1941 chairman of the Pacific Coast

Bruce Robinson

District of the American Petroleum Institute Division of Production. The election closed the A.P.I. Annual Spring meeting in Los Angeles in which attendance reached the high mark of 900.

Other officers elected are E. L. Davis of The Texas Co.; R. W. Borden of the Barnsdall Oil Co., and Paul E. Lehr of the Shell Oil Co., as vice-chairmen; W. G. Corey of Pacific Gear & Tool Works as treasurer, and D. S. Kilgour as secretary.

The advisory committee of which R. N. McMaster is chairman, includes L. L. Aubert, A. H. Bell, L. A. Cranson, J. F. Dodge, E. G. Gaylord, E. B. Hall, W. L. Heater; R.P. Huggins, Joseph Jensen, William Keck, Jr., R. L. Keyes, W. N. Lacey, M. A. Machris, R. D. Montgomery, R. C. Patterson, B. E. Parsons, H. C. Pyle, E. E. Pyles, Bruce H. Robinson, J. D. Sutherland, C. P. Watson, H. T. and W. C. Whaley.

Bruce Robinson was born in Phoenix, Arizona, in 1899, the son of W. H. Robinson, writer and Arizona pioneer. He was educated at the University of New Mexico and the United States Naval Academy at Annapolis.

After leaving school, he spent a year and a half in the Mid-Continent as oil scout and tank builder. He came to California in 1925, securing a job with the General Petroleum Corporation as time-keeper. In 1927, he started production engineering work under H. N. Marsh of that company, and in 1937 was made field superintendent for General Petroleum in the Los Angeles Basin District.

He has been active in A.P.I. activities, serving as California chairman of the Topical Committee on Production Practice in 1936; as National Chairman of the same committee in 1937, and as National Chairman of the Topical Committee on Drilling Practice in 1940.

He was elected Chairman of the Pacific Coast District of the A.P.I. at the annual meeting at the Biltmore Hotel, Los Angeles, on March 11th, succeeding R. N. McMaster, of the Chanslor-Canfield Midway Oil Co.

Gen. Hugh S. Johnson Oil Association Speaker

The California oil industry will act as host to California business at the 1941 Annual Dinner Meeting of the California Oil and Gas Association on the evening of April 3, at the Biltmore Bowl, Biltmore Hotel. The principal speaker will be General Hugh S. Johnson, prominent newspaper columnist and former N.R.A. Administrator, who will fly to Los Angeles for the occasion. Guests will include oil men and leaders of industry, banking, and education. Invitations have been extended to Governor Olson, Mayor Bowron, and representative officials of California oil producing counties.

New rainshield that fits over an automobile tank opening and the nozzle of the gasoline hose prevents rain from entering the tank when it is being filled on a rainy day.

"TAKING THE GUESSWORK OUT OF OIL WELL CEMENTING"

Numerous mechanical devices have emerged from a long range development program to eliminate guess work in oil well cementing. They include:

1. **Kinley Calipers***, for progressively measuring the actual variations in diameter of open hole, for the purpose of making accurate volumetric calculations of the portion of the well to be cemented and for accurate packer settings.
2. **The Echometer,** which instantly determines the fluid levels necessary for proper control of balanced cementing jobs when plugging back in formations with high permeability and low fluid pressure.
3. **Bulk Cementing,** which eliminates the error due to waste when handling cement in sacks and makes possible accurate compounding of admixes with dry cement.
4. **Synchronized Pumps and Mixers and Slurry Meter,** which maintain a pre-determined controlled slurry.
5. **The Compressometer,** which measures the change in volume of drilling mud at atmospheric and at high pressures when used as a displacing fluid.
6. **The Dehydrator,** which provides an understanding of the changes in volume, plasticity and setting time of cement slurry imposed under high pressure against a permeable formation.
7. **Admixture Proportioners,** which feed definite amounts of various ingredients into cement.

**Named in honor of Myron Kinley, who, between blowouts, pioneered the caliper field. A recent joint program between Kinley and Halliburton has developed an electrical caliper that is now ready for daily use.*

HOWCO RESEARCH

HALLIBURTON OIL WELL CEMENTING CO.

THIS LAUGH

OFF!!

R. L. Minckler tells this one:

Judge: "What possible excuse could you have for acquitting this prisoner?"

Foreman: "Insanity, sir."

Judge: "What, all twelve of you?"

Then, there was the injured rousty laying on the stretcher when the boss approached and asked him: "Are you married, buddy?" "No," was the faint response. "This is the worst thing that ever happened to me."

Which, for no apparent reason, reminds us of **Ed Bartosh's** story:

"I'm so sorry, it was all my fault."

"Not at all, madam, I was to blame myself."

"But I insist the fault was mine. I was on your side of the street."

"That may be true, but, my dear madam, I am responsible for the collision. I saw you coming blocks away and had ample time to dart down a side street."

Somewhere, **Karl Nielsen** picked up this item:

Notice in Scotch church: "Those in the habit of putting buttons instead of coins in the collection plate will please put in their own buttons and not buttons from the cushions on the pews."

Bill Greenfield tells this one:

Three Englishmen, all slightly deaf, were motoring to dear old London. As they were nearing the metropolis one asked: "I say old chappie, is this Wembley?"

"No, old thing," replied the second gentleman, "this is Thursday."

"By Jove, so am I," replied the third gentleman, "Let's stop and have one."

And **Hudson Drake** comes up with this one:

Reporter: "Well, boss ,I've got a perfect news story!"

Boss: "The man bit the dog?"

Reporter: "Naw, the bull threw the salesman."

Which bit of natural history reminds us of **C. J. Gibson's** story:

A simple countryman saw a gaudy-plummaged parrot on the roof of his cottage. He climbed to capture it.

The parrot looked at him and said sharply, "What do you want?"

The countryman touched his cap. "Beg pardon, sir. I thought you was a bird."

"You were sent here, I believe, for writing a glowing prospectus for an oil company."

"Yes," said the prisoner, "I was a little too optimistic."

"Well," went on the warden, "the authorities want a report on conditions in this prison. I've decided to let you write it."

Then, for no reason at all, we are reminded of a story told by **Johnny McMillan:**

Officer: "How on earth did you make those four straight hits? The range is 600 yards and your sights are set for 300 yards."

Rookie: "See that little rock half way up to the target? I'm bouncing them off of it."

An eminent but straight-laced judge was being entertained by a charming hostess. She offered him a glass of champagne. "No thank you," he replied stiffly. "I tried it once and didn't like it." He lapsed into silence until a little later she passed him a cigarette. "No thank you," he said again. "I tried it once and didn't like it." Another long silence and the hostess, in a desperate effort to make conversation, asked him how many children he had. "Children, madam?" said the judge. "I have but one!"

Then, there's **Fred Smith's** story about Rastus:

Rastus summoned the doctor to the birth of his fifteenth child. "Rastus," scolded the medico, "you're just a no-account nigger. What you ought to do is go out and hang yourself."

Months passed and the doctor was called again. "Rastus," said the doctor, "I thought I told you to hang yourself."

"Yessah, doctor," moaned Rastus, "I tied a rope aroun' mah neck, I climbed up into de apple tree, made de rope fas' and was jes' about to jump when suddenly ah got a thought. Mebee I was hangin' the wrong nigger."

Names used on this page are entirely fictitious, and any resemblance to persons either living or dead is purely coincidental.

WEIGHT INDICATOR POINTS
It's an old Martin-Decker custom to give the customer what he wants . . . but at the same time Martin-Decker wants the customer to have the instrument best suited to his job.
Take Tool Pusher Model Weight Indicators and Unitized Mud Pump Gauges, for example. These instruments are fine for some jobs. But as drilling problems become more complex, such instruments — located at great distances from the driller—cannot be expected to provide the information needed to meet these problems effectively.
Centralized instrument control with the "Sealtite" Weight Indicator, "Sealtite" Mud Pump Gauge, Torque Gauge and Tachometer is the answer.
MARTIN-DECKER CORP., LONG BEACH, CALIF.

CRUDE OIL PRICES AT THE WELL

THE FOLLOWING ARE THE PRICES OF THE

STANDARD OIL COMPANY OF CALIFORNIA

FOR ITS CURRENT PURCHASES OF CRUDE OIL AT THE WELL
(UNLESS OTHERWISE SPECIFIED)

EFFECTIVE AT 7:00 A. M. MARCH 12, 1941

SAN FRANCISCO, CALIFORNIA MARCH 11, 1941

PRICE PER BARREL IN FIELDS INDICATED

(ALL GRAVITIES ABOVE THOSE QUOTED TAKE HIGHEST PRICE OFFERED IN THAT FIELD)

GRAVITY	SIGNAL HILL (LONG BEACH)	WILMINGTON	EL SEGUNDO	SEAL BEACH	HUNTINGTON BEACH	INGLEWOOD	PLAYA DEL REY	OLINDA BREA CANON	ATHENS-ROSECRANS	TORRANCE	RICHFIELD	WHITTIER EAST COYOTE (LA HABRA)	MONTEBELLO	WEST COYOTE HILLS	SANTA FE SPRINGS	NEWHALL, KERN RIVER, KERN FRONT, MCKITTRICK, ROUND MOUNTAIN	GREELEY C.-HAL, WASCO	COLES LEVEE	MOUNTAIN VIEW	ELK HILLS, BUENA VISTA HILLS, MIDWAY-SUNSET, LAKEVIEW AREA	LOST HILLS	COALINGA	WHEELER RIDGE	KETTLEMAN HILLS	ELWOOD TERRACE	GRAVITY
14-14.9	$.65	$.60	$.65	$.64	$.63	$.64	$.65	$.61		$.65	$.61	$.61	$.62	$.63		$.65				$.65	$.65	$.65				14-14.9
15-15.9	.65	.60	.65	.64	.63	.64	.65	.61		.65	.61	.61	.62	.63		.65				.65	.65	.65				15-15.9
16-16.9	.65	.60	.65	.64	.63	.64	.65	.61		.65	.61	.61	.62	.63		.65				.65	.65	.65				16-16.9
17-17.9	.65	.62	.65	.64	.63	.68	.65	.61		.65	.61	.61	.62	.63		.65				.65	.65	.65				17-17.9
18-18.9	.65	.64	.65	.64	.63	.71	.65	.65		.68	.61	.61	.62	.63		.65				.65	.65	.65				18-18.9
19-19.9	.69	.69	.69	.64	.67	.75	.70	.69		.72	.61	.65	.62	.63		.65			$.65	.65	.67	.65	$.65			19-19.9
20-20.9	.73	.73	.73	.64	.72	.79	.74	.74		.75	.65	.69	.62	.67					.65	.69	.70	.65	.65			20-20.9
21-21.9	.78	.78	.78	.64	.76	.82	.81	.78		.79	.69	.73	.62	.72	$.63				.65	.74	.74	.67	.69			21-21.9
22-22.9	.82	.82	.82	.69	.81	.86	.86	.82		.82	.73	.77	.66	.76	.63				.68	.79	.78	.70	.65			22-22.9
23-23.9	.86	.86	.86	.75	.85	.89	.92	.86	$.71	.86	.78	.82	.71	.81	.67				.71	.84	.82	.74	.68			23-23.9
24-24.9	.90	.90	.90	.80	.90	.93	.97	.90	.77	.89	.82	.86	.75	.85	.72				.75	.89	.86	.78	.71			24-24.9
25-25.9	.95	.95	.95	.86	.94	.96	1.02	.95	.82	.93	.86	.90	.80	.89	.77				.79	.94	.90	.82	.75			25-25.9
26-26.9	.99	.99	.99	.91	.99	1.00	1.08	.99	.88	.95	.90	.94	.84	.94	.82				.83	.99	.95	.85				26-26.9
27-27.9	1.03	1.03	1.03	.97	1.03	1.04		1.03	.94	1.00	.94	.98	.89	.98	.87		$.83	$.92	.87	1.04	.99	.89				27-27.9
28-28.9	1.07	1.07	1.07	1.02	1.07	1.07	FOB	1.07	.99	1.03	.98		.93	1.02	.91		.86	.95	.91	1.09	1.03	.92				28-28.9
29-29.9	1.10	1.10	1.10	1.07	1.11	1.10	OUR	1.10	1.04	1.06	1.02		.98	1.06	.96		.89	.97	.95	1.14	1.07	.94				29-29.9
30-30.9	1.14	1.14	1.14	1.12	1.15	1.14	PIPE	1.14	1.09	1.09			1.02	1.10	1.01		.92	.99	.99	1.19	1.11	.97				30-30.9
31-31.9						1.17	LINE	1.17	1.14				1.07	1.14	1.05		.95	1.02	1.02			.99			FOB	31-31.9
32-32.9						1.20		1.20	1.19				1.11	1.18	1.09		.98	1.04	1.06			1.02			SHIP	32-32.9
33-33.9									1.24				1.15	1.22	1.14		1.01	1.07				1.04		$ 1.04	$1.13	33-33.9
34-34.9									1.29				1.20	1.26	1.19		1.04	1.09				1.07		1.08	1.15	34-34.9
35-35.9									1.34				1.24		1.23		1.07	1.12						1.12	1.19	35-35.9
36-36.9									1.39				1.28		1.27		1.10	1.14						1.15		36-36.9
37-37.9									1.44				1.33		1.31		1.13	1.16						1.19		37-37.9
38-38.9									1.49				1.37		1.36		1.16	1.19								38-38.9
39-39.9									1.54				1.42				1.19									39-39.9
40-40.9									1.59				1.46													40-40.9
41-41.9													1.50													41-41.9
42-42.9													1.54													42-42.9
43-43.9													1.59													43-43.9
44-44.9													1.63													44-44.9
45-45.9													1.67													45-45.9
46-46.9													1.71													46-46.9

Standard Announces Crude Price Changes

Standard Oil Co. of California herewith announces effective at seven A.M. March 12, 1941 an adjustment in prices it offers for its current purchases of crude oil in the San Joaquin Valley fields and the Elwood field. These adjustments consist of an increase of five cents per barrel in the heavy crude oils and a maximum reduction of ten cents a barrel up to thirty seven degrees gravity with a top on higher gravities of one dollar and nineteen cents per barrel. This adjustment is made in accordance with the trend of current demand for the various grades of crude oil involved.

Contractors Appoint Brad Mills Secretary

American Association of Oilwell Drilling Contractors has announced appointment of Brad Mills as executive secretary, effective March 16, 1941.

Mr. Mills was connected with The Oil Weekly for 16 years, having been associate editor since 1935. He has been associated with the oil industry since 1920.

The Association was formally organized last year. Headquarters will be maintained in Dallas.

Engineering, Technology, latest news—twice a month in California Oil World.

a New CLAK

3,000 H.P. in 1

K Development

CLARK STEAM-DRIVEN "ANGLE" COMPRESSOR

Sizes up to 4,000 H. P.

In response to a request by the Union Oil Company of California, for a large-capacity CLARK "Angle" Compressor with steam drive — Clark recently designed and built two 3,000 H. P. "Angle" units — one of which is shown at left.

These two units, equal to a battery of ten 6-cylinder, 600 H. P. CLARK gas-driven "Angles", — are being installed in Union's refinery at Oleum, California, along with three 8-cylinder CLARK gas-driven "Angles" equipped with our new supercharged power cylinders and developing 1,000 H. P. per unit.

The new CLARK Steam-Driven "Angle" is equipped with Unaflow steam cylinders, noted for economical operation. The particular features of this compressor are small floor space requirements, low foundation and building costs, economical steam rates, flexibility, and minimum maintenance costs due to the smallness of the parts. Tests indicate this unit will set new records in its field for low first cost, low maintenance, and low operating cost per horsepower. It is available in sizes from 600 to 4,000 H. P. Get in touch with our nearest office for complete information.

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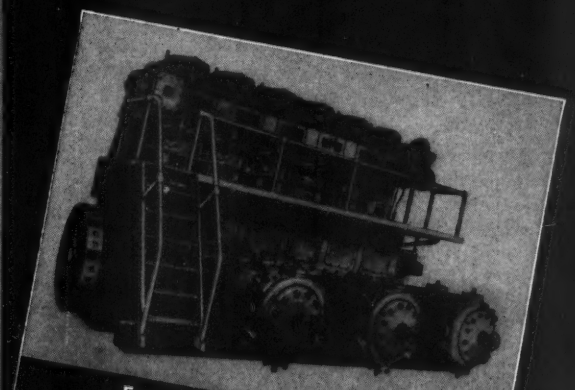
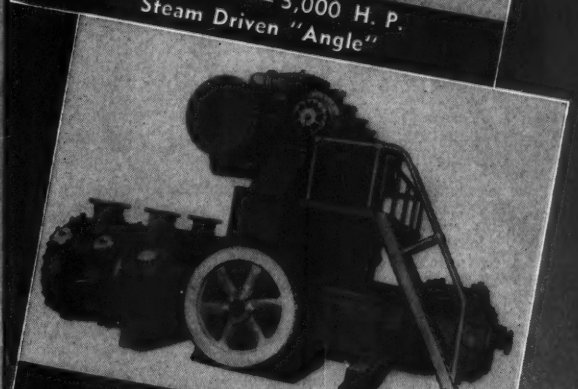


Front View — 3,000 H. P.
Steam Driven "Angle"



Side View — 3,000 H. P.
Steam Driven "Angle"

CLARK

COMPRESSOR UNIT

Valley Oil Men's Association President

Urges Enlightened Government View

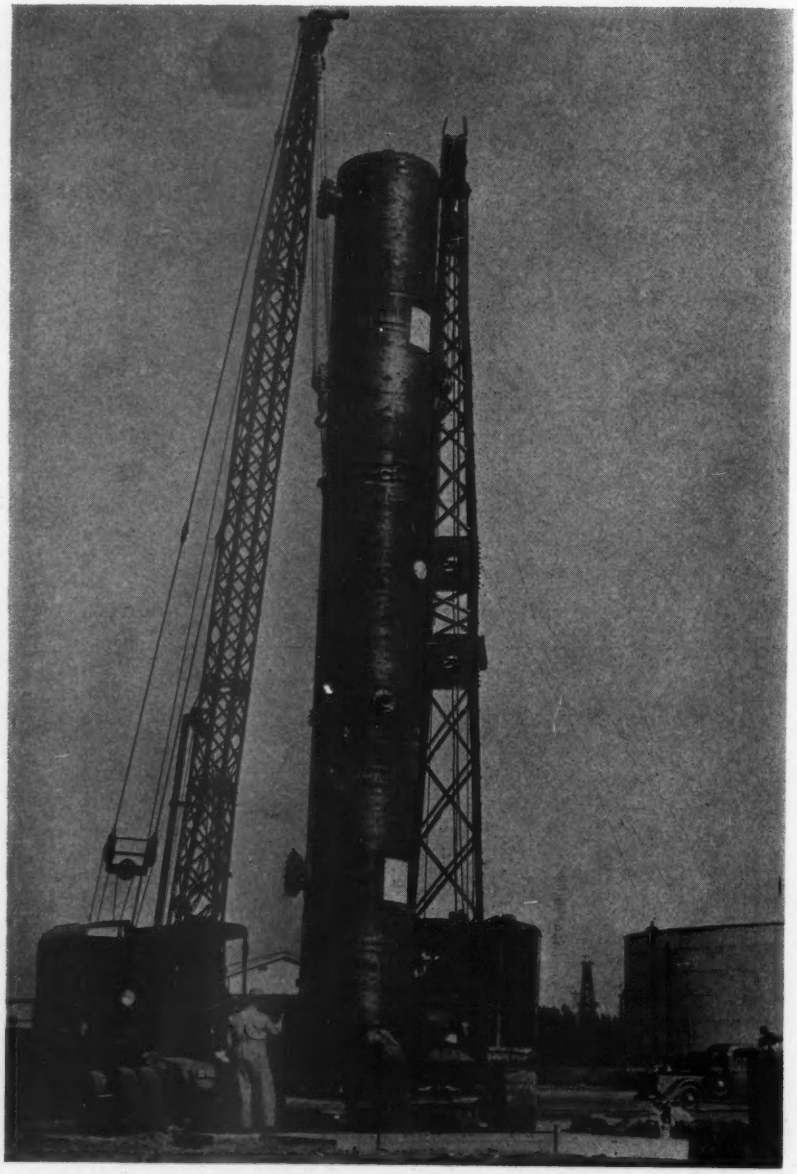
By Dana Hogan
President San Joaquin Valley Oil Men's Assn.

Kern County produces the highest and the lowest gravity oil in the State of California, together with the intermediate grades. It produces oil from the greatest depths and from the shallowest depths in the state. It has more acres of proven oil land than any other county in the state. Therefore Kern County is vitally interested and affected by everything pertaining to the oil industry of the Pacific Coast.

If the price of crude oil rises or falls so does the prosperity of Kern County rise and fall. Similarly, an increase or decrease in allowable production of Kern County affects its prosperity. An increase or decrease of oilfield payrolls vitally affects the majority of the residents of Kern County. At the present time, due to the small allowables and strict curtailment of producing oil wells and the low prices received for crude oil, the prosperity of Kern County is not what it should be. The loss or decrease in the general income of Kern County from crude oil produced and sold within its boundaries has come at a time when the residents of Kern County who own property or are gainfully employed are bearing an ever increasing and crushing burden of federal, state, and particularly county taxes. County taxes, over two-thirds of which are paid by the oil industry, have more than trebled in the past few years due to the great influx of unemployed and unemployable migrants from Eastern Oklahoma, Arkansas and Northeastern Texas, whom the people of Kern County are forced by law to support.

It may be said that Kern County is making the greatest contribution to national defense of any county in the United States, because it is virtually giving away its oil for less than cost to the Navy at about one-third of the price it received during the last war. By curtailment of production and drilling, and the low crude oil prices, hundreds of men in Kern County have been thrown out of employment and have had to seek employment elsewhere. Their earnings are lost to Kern County's income. This curtailment might not be necessary if the federal government would partially shut off the flood of over 300,000 barrels a day of cheaply produced South American oil that is now coming into the United States and displacing in the American markets a portion of Kern County's heavy oil. Naturally when the large payroll in Kern County shrinks it affects all of the merchants and business men in Kern County while at the same time it increases the tax burden of those remaining who are employed or have property as the unemployed migrants stay on and do not seem willing to shift to places where employment is available.

The federal government has attempted in a bungling way to regulate and stabilize agriculture which stands with oil producing as the major industries of Kern County. For the curtailment of production of agricultural products and limiting the amount of acreage upon which crops are to be grown, the federal government acting as agent for the nation's taxpayers gives the agriculturists parity payments and attempts to raise and peg prices so that the agriculturist will suffer no loss in his income. This is a false and artificial economic theory bound to collapse, as every sound experienced person knows, if allowed to continue indefinitely as it runs counter



First to answer the call for National Defense, the petroleum industry has not waited for subsidies to increase production of fighting grade fuels.

to the fundamental law of supply and demand which when allowed to act naturally produces a fair average price throughout the years.

Such a situation does not exist in the oil industry as it has resisted government control. It feels that it should not surrender its independence to the government for a parity payment by it from the taxpayers' money but prefers to retain its freedom and to receive the parity payment directly from the consuming public in the way of proper prices for its products.

The oil industry has seen the bad effects of federal domination of the agricultural industry, which combined with the experience it had during the N.R.A. under Federal Oil Administrator Ickes, has made the oil industry fearful of government control and its attendant bungling and incompetence of theoretical, impractical, politically ambitious, and inexperienced administrators.

To annihilate reasons for the seizure of the industry by the federal government, California has instituted an excellently functioning voluntary self-regulatory program for the purpose of producing under the efficient conditions the amount of oil necessary for consumption and conserving un-needed oil in the ground. Also, the hope of the oil producers is that by such voluntary stabilization they will receive a fair and rightful price for their product from the public rather than a parity payment from the government for surrendering their freedom. However, the oil producers of Kern County are not receiving a fair price for their product as a reward for conserving production and it seems only fair that the public should recognize this and be willing to pay rightful prices for crude oil and its products. The prices for crude oil and its products are ridiculously low compared with other commodities, as the government's own figures show that the price index for crude oil and its products is only 49.3 as compared with 79.6 for all other commodities, and furthermore that oil and its products price index has been going down this past year while the price index of all other commodities has been going up.

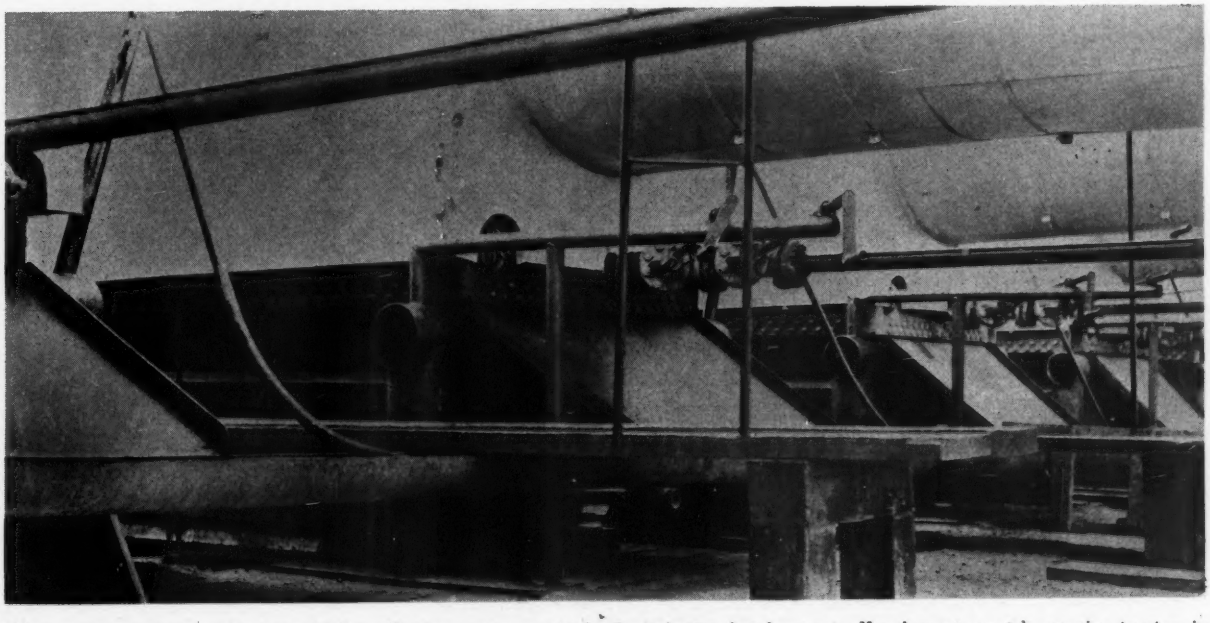
The difficulty about restoring the price of crude oil and its products to its merited levels is that the large crude oil purchasing companies have been warned by the government that if they should agree among themselves to restore the price to its proper level that they are liable to prosecution and persecution by the government for price fixing although the government officials can conspire to fix the prices for agricultural and any other commodities. In other words the present administration, who seem most anxious to assume a socialistic control over all industries, say that if the oil industry will give up its fight against government control and become socialized the federal officials may be able to restore the prices of crude oil and its products to their proper levels.

The recent price adjustment was disappointing in that it only raised heavy oil five cents a barrel and drastically lowered prices on light oil so that the gross income of all Kern County oil producers in the aggregate remained about the same. A further readjustment and restoration of prices for crude oil and its products is justified forthwith. This should and can be done by the purchasing companies if they have courage while they still have freedom of action and it should not resolve itself down to a question as to whether the oil producers, to keep alive, should be forced to surrender their freedom to government control for the price increase or parity payments, or continue under present unfair conditions.

Higher prices for oil and its products mean higher wages and more men employed. An industry that is not prosperous holds little promise to its workers. Private endeavor and energy has built this industry furnishing livelihood for a million people. To turn it over to ambitious politicians who are interested not in its prosperity but only in votes and political power would be a calamity for the employees and the consuming public. It would mean lower wages for the employee and higher prices for the consumers. Freedom is priceless and once lost it is difficult to regain. It is much better to be poor and free than well-to-do and a political slave.

Two thousand Italian farmers are retiring at sunset every night to conserve lamp oil.

More than $50,000 was spent to equip a new California oil refinery with automatic control, indicating and recording instruments.



These super burners to increase boiler efficiency are a typical oil industry development. You have to watch pennies to stay in the oil business, these days.

Weathering Test Analysis for Propane,

Isobutane, and N-Butane Mixtures

C.N.G.A. March Meeting Paper

By O. N. Miller, L. G. Horn and W. K. Venatta

Abstract

The test method described is applicable to the analysis of a wide range of propane, isobutane, N-butane hydrocarbon mixtures encountered in field and refinery operations. The apparatus is simple, the procedure rapid, and the results are sufficiently accurate for routine control of plant operations and quality of products.

Introduction

With the increasing importance and value of light hydrocarbon fractions to the petroleum industry, one of the most important responsibilities of the plant operator is to keep losses of these valuable hydrocarbons to a minimum. As the industry has progressed rapidly in the past few years, and several new processes have been developed and used commercially, there has been a general need for a rapid, inexpensive, and reliable testing procedure for analyzing streams consisting of mixtures of propane, isobutane, and N-butane.

To our knowledge, the only other recognized method of analyzing streams containing these hydrocarbons is that of fractional distillation. Although fractional distillation is the recognized precision method for analyzing mixtures of hydrocarbons, it is time consuming and expensive, thus making it undesirable for control work in plant operations.

As other weathering tests developed in the past have proven to be economical and reliable,[1] the development of this present test was undertaken and investigation led to the present weathering test procedure.

Apparatus and Procedure

The apparatus and the procedure employed in the test, in general, have been made to conform as closely as possible with those employed in other weathering tests. The weathering tube is the same as that adopted for previous weathering tests with the exception of extended scale divisions and of the inclusion of a vent at the top of the tube for removal of vapors during weathering. Figure 1 shows a detailed sketch of the weathering tube. A special thermometer (Figure 2) of 0°F. to 35°F. range and graduated in divisions of 0.2°F. was adopted for the determination of the necessary weathering temperature. As the specifications shown in Figures 1 and 2 for the centrifuge tube and the thermometer are critical with regard to the accuracy of the test, they have been adopted as standard equipment.

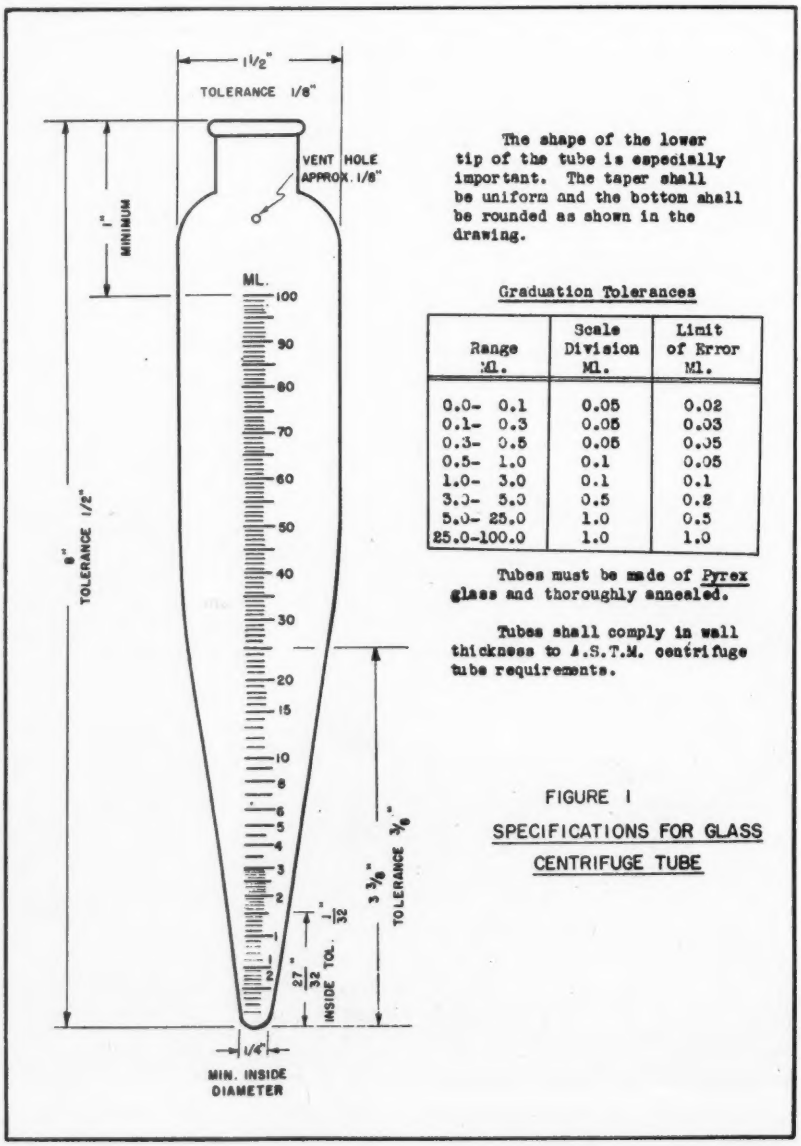
Briefly, the test is conducted as follows:

(1) The sample to be analyzed is passed (under pressure) through a cooling coil immersed in liquid propane.

(2) Two grains of 8-14 mesh charcoal are placed in the cold weathering tube, which has been chilled by immersion in a liquefied butane bath, and the tube is then filled to the 94 ml. mark (at the temperature of liquid propane) with the sample that is to be analyzed. Filling to the 94 ml. mark was chosen for convenience; when the thermometer is inserted into the tube and the sample has reached its boiling point, the liquid level in the centrifuge tube will be at the 100 ml. mark.

(3) The thermometer is adjusted to position, and with the tube suspended with its tip immersed in a water bath, the sample is allowed to weather.

(4) Temperatures are recorded when the residual volume in the centrifuge tube, with the thermometer in place, is at the 50 ml. mark and at the 15 ml. mark respectively, and the percentages of propane, isobutane, N-butane in the sample are read from the weathering curves shown in Figure 5.



The shape of the lower tip of the tube is especially important. The taper shall be uniform and the bottom shall be rounded as shown in the drawing.

Graduation Tolerances

Range Ml.	Scale Division Ml.	Limit of Error Ml.
0.0- 0.1	0.05	0.02
0.1- 0.3	0.05	0.03
0.3- 0.5	0.05	0.05
0.5- 1.0	0.1	0.05
1.0- 3.0	0.1	0.1
3.0- 5.0	0.5	0.2
5.0- 25.0	1.0	0.5
25.0-100.0	1.0	1.0

Tubes must be made of Pyrex glass and thoroughly annealed.

Tubes shall comply in wall thickness to A.S.T.M. centrifuge tube requirements.

FIGURE 1

SPECIFICATIONS FOR GLASS CENTRIFUGE TUBE

[1]. (a) R. N. Donaldson: Petroleum World, Volume XXXII, No. 3, Page 27, March, 1935.
(b) Bulletin No. TS-392—California Natural Gasoline Association.

FIGURE 3

DETAIL OF SAMPLING APPARATUS

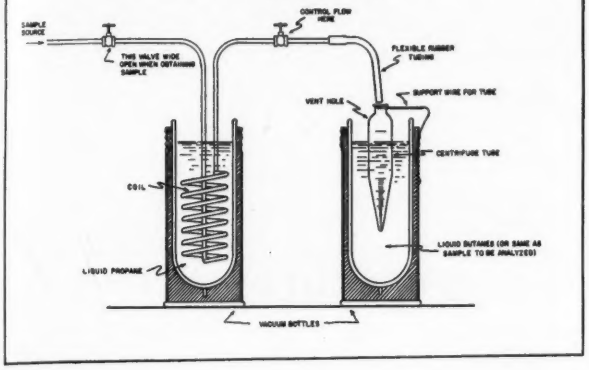
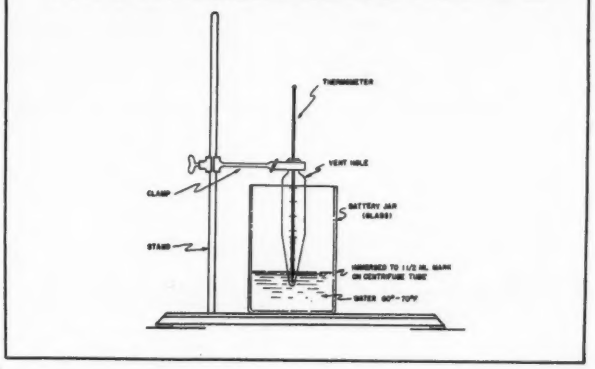


FIGURE 4

POSITION OF CENTRIFUGE TUBE WHILE SAMPLE IS WEATHERING



The time required for weathering the sample is about 45 minutes.

Figures 3 and 4 show the method of obtaining the sample for analysis and the method of weathering the sample. A detailed description of the apparatus and procedure for conducting the test is given in the appendix to this report.

Development of Weathering Curves

To develop the weathering curves, tests were conducted by weathering known mixtures of substantially pure propane, isobutane and N-butane. All of these base stocks were analyzed by fractionation and were found to be of the following purity:

(1) Isobutane—Less than 0.3% N-butane, no pentane or propane

(2) Normal butane—Less than 0.2% Isobutane, no pentane or propane

(3) Propane — Less than 0.2% Butanes, trace of ethane

Numerous blends of the base stocks were prepared covering the following range:

1. Isobutane: 35.0%-100%
2. N-butane: 0%-65%
3. Propane: 0%-25%

The blends were accurately prepared by evacuating the weathering tube and then condensing known quantities of the pure hydrocarbon vapor into the evacuated centrifuge tube. After each blend was prepared, the stock was allowed to weather in the manner described in the appendix to this report, and complete temperature data were recorded during the weathering procedure. From the weathering test data thus obtained on the known blends, correlations of the weathering temperatures were made resulting in the weathering test curves (Figure 5). It was found that the weathering temperatures corresponding to the residual volume in the centrifuge tube at the 50.0 ml. mark and the 15.0 ml. mark resulted in the most accurate correlation with composition. The range covered by the weathering curves is consistent with the compositions of streams generally encountered commercially containing the hydrocarbons propane, isobutane and N-butane. A reasonable extrapolation of the curves is believed permissible, or the range could be extended as desired by additional tests on mixtures of known composition.

General Discussion of the Test

The test is inexpensive and accurate for determining the composition of a mixture containing propane, isobutane and N-butane. The test cannot be applied with reliable accuracy if other hydrocarbons are present (such as ethane, pentane, or olefin). Because of the limits of accuracy in running the test, it is not valid for determining very small percentages of propane (0-1.0%) or for very high concentrations (above 95%) of isobutane. The test can be applied at any locality provided temperature corrections for varying barometric pressures are made as shown in the test procedure.

The accuracy that can be expected by analyzing the sample by weathering test is as follows:

Constituent	Average Deviation—%	Maximum Deviation—%
Propane	±0.5	±2.5
Isobutane	±0.6	±1.5
N-butane	±0.5	±1.0

Compared with fractional distillation methods, the weathering test is much less time consuming and less expensive. Approximately 45 minutes are required to analyze the sample, and only a small amount of inexpensive and easily replaced equipment is required. Analyzing the same sample by fractional distillation would require 5-10 hours, and the use of expensive equipment and a skilled operator.

Practical Application

The method described has application in the analysis of hydrocarbon mixtures consisting of propane, isobutane and N-butane that are normally encountered in field and refinery operations. The rapidity, simplicity and accuracy of the test make it particularly well suited for routine quality control and plant control testing.

Figure 2

Specification for Weathering Test Thermometer

Type: Etched stem, glass

Liquid: Mercury

Range: O° to 35°F.

Overall Length: 14 to 16 inches

Length of Scale: 10 to 12 inches

Division: 1/5 deg. F.

Stem: Plain front, enamel back; suitable thermometer tubing.

Diameter: 5 to 8 mm.

Bulb: Corning normal or equally suitable glass

Length: 18 to 19 mm.

Diameter: 5 to 6 mm.

Graduations: All lines and figures clear cut and distinct; the first and each succeeding degree line to be longer than the remaining lines; graduations to be numbered at each multiple of 2.0°F.

Immersion: 1½ inches

Scale Error: The error at any point in the scale shall not exceed plus or minus 0.1°F.

The thermometer shall be provided with a tapered contraction chamber at least 1.0 inch above the 35°F. mark to permit expansion of the mercury to 140°F.

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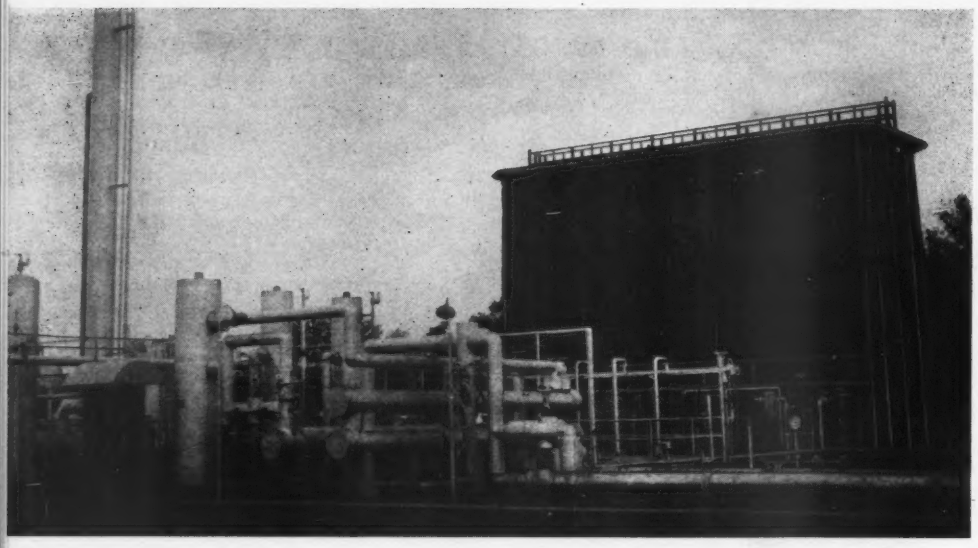
1. Recovery through low temperature, using Mechanical Refrigeration.

EXAMPLE: In Cayuga Field, Texas-- Capacity: 11,800,000 cu. ft. of gas per day.



Separation Pressure: 1,200 lbs.

Input Pressure: 1,600 lbs.

Production: 6,500 gals. per day of stabilized distillate.

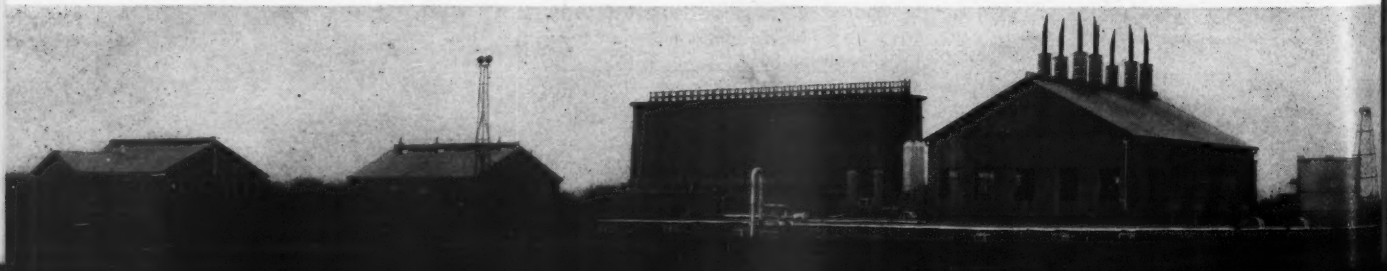
2. Recovery through low temperature, using Regenerative Cooling Cycle.

EXAMPLE: In Corpus Christi area, Texas--Initial capacity: 55 million cu. ft. of gas per day.

Separation Pressure: 1,200 lbs.

Input Pressure: 2,800 lbs.

Production: 51,000 gals. per day of stabilized distillate.



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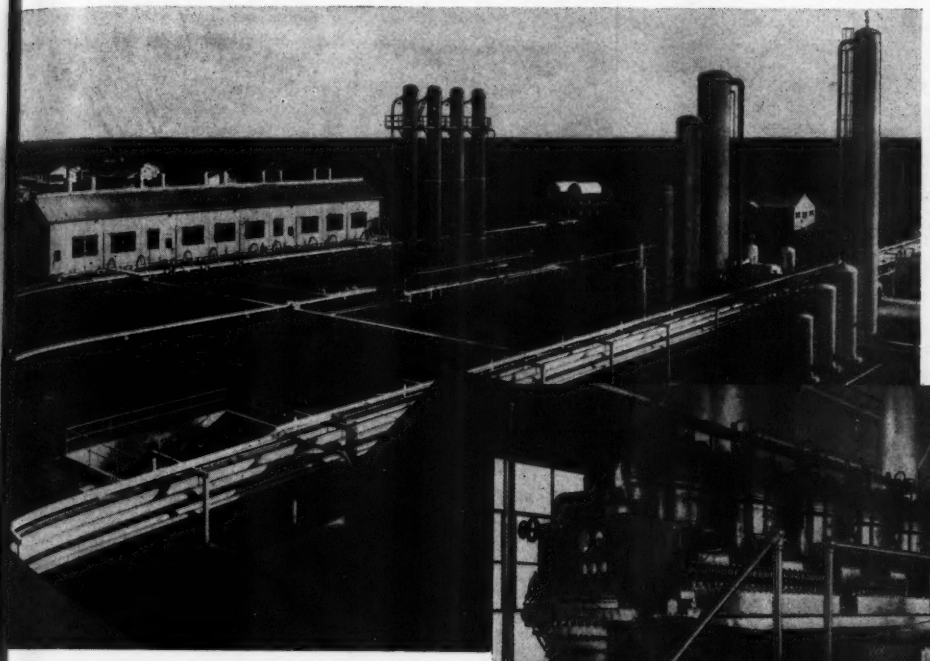
3. Recovery by high pressure Absorption Process

EXAMPLE: In Corpus Christi area, Texas--



Largest high pressure Absorption plant --- Capacity: 128 million cu. ft. of gas per day (designed for ultimate capacity of 140 million cu. ft.).

Absorber Operating Pressure: Up to 1,500 lbs. per sq. in. Compressors operating at 1,350 lbs. suction, 2000 lbs. to 2,200 lbs. discharge.

Production: 105,000 gals. per day motor gasoline, 6,000 gals. per day of kerosene.

(Another plant completed in 1940 in Corpus Christi area — same operating conditions, but two-thirds the capacity.)

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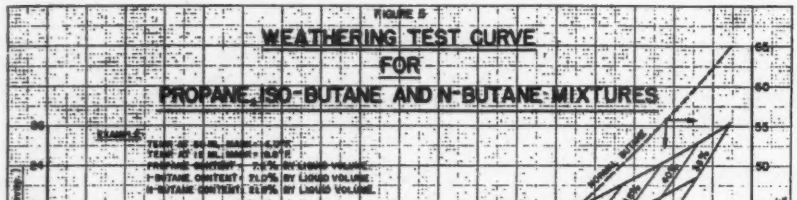
FIGURE 5
WEATHERING TEST CURVE
FOR
PROPANE, ISO-BUTANE AND N-BUTANE MIXTURES
EXAMPLE:
TEMP. AT 50 ML. MARK = 6.0°F.
TEMP. AT 15 ML. MARK = 69.5°F.
PROPANE CONTENT = 7.0% BY LIQUID VOLUME
I-BUTANE CONTENT = 71.0% BY LIQUID VOLUME
N-BUTANE CONTENT = 22.0% BY LIQUID VOLUME
TEMPERATURE WITH RESIDUE AT 50 ML. MARK °F (approx. 80% evap.)
TEMPERATURE WITH RESIDUE AT 15 ML. MARK °F (approx. 95% evap.)
NORMAL BUTANE - % BY LIQUID VOLUME
ISOBUTANE - % BY LIQ. VOL.
% BY VOL. CLOSE
NOTE PROBABLE ACCURACY
AVE. DEVIATION
MAX. DEVIATION
PROPANE ±0.5 ±2.0
I-BUTANE ±0.6 ±1.5
N-BUTANE ±0.5 ±1.0

Appendix

Detailed Procedure for Weathering Test Analysis of Propane, Isobutane, N-butane Mixtures

Apparatus

1. **Weathering Tube:** The weathering tube shall consist of a pyrex centrifuge tube conforming to the specifications shown in Figure 1.

2. **Standard Thermometer:** The thermometer shall conform to the specifications shown in Figure 2.

3. **Weathering Tube Support:** A suitable means of support shall be provided for supporting the weathering tube by its neck in a vertical position, either in the water bath or in air (See Figure 4).

4. **Cooling Coil:** The cooling coil shall consist of 4 feet of ¼ inch O. D. seamless copper tubing formed into a spiral by winding on a short length of ¾ inch pipe, allowing sufficient length of tubing to connect the bottom of the spiral to the liquefied gas sampling connection. The outlet extension of the coil shall be fitted with a needle valve, and a short piece of flexible tubing shall be attached to the valve outlet for insertion into the neck of the weathering tube.

5. **L.P.G. Cooling Baths:** Two liquefied petroleum gas cooling baths will be required. One bath shall consist of a one-quart, wide-mouth pyrex vaccum bottle filled with liquefied propane (Bath A), and shall be used as the coil cooling bath. The other bath shall consist of a similar vessel filled with the liquefied petroleum gas that is to be analyzed (Bath B), and shall be used as the cooling bath for the centrifuge tube.

6. **Water Bath:** The water bath shall be at least 4 inches in depth and of sufficient volumetric capacity that it will maintain a temperature of 60°-70°F. throughout a test by a single temperature adjustment before starting. A glass battery jar, approximately 6 inches O. D. and 12 inches high, is recommended.

7. **Ice Bath:** A one-quart thermos bottle filled with an excess of finely crushed ice in pure (distilled) water shall be provided to check the accuracy of the thermometers at 32°F.

8. **Weathering Tube Calibration:** The graduations of the weathering tube shall be checked before using the first time by calibration at the 15.0, 50.0, and 94.0, ml. graduations. The calibration shall be made with water and suitable standardized pipettes. Errors in graduations of 0.5 ml. at the 15 ml. graduation and 1.0 ml. at the 50 and 94 ml. graduations are the maximum acceptable deviations.

Procedure

9. The weathering tube shall be thoroughly cleaned and dried before using. It is essential that the tube shall be absolutely free from any heavy hydrocarbon fractions. The test is applicable only to mixtures of propane, isobutane, and N-butane.

10. The accuracy of the weathering test thermometer shall be determined by insertion, in a vertical position, in the ice bath. If the thermometer fails to read 32.0°F. ± 0.1°F., an attempt should be made to adjust the thermometer to that condition by warming to above 40°F., tapping gently to cause any separated globules of mercury to join the main column, and recooling. If the thermometer is in error with the mercury column intact, it should not be used in this test.

11. If special accuracy is required, or if the test is to be used at locations substantially above sea-level, temperature corrections should be made for variations in barometric pressure (see paragraph 25).

12. The temperature of the water bath shall be adjusted to 60°-70°F.

13. The cooling coil shall be attached to the container or line being sampled at a point that will insure drawing a representative sample. (Prior to attaching the sampling apparatus, open and quickly close the sampling valve to blow out condensate and water). The outlet valve on the coil shall be closed and the valve on the sample source line opened wide.

14. The liquefied propane cooling bath (Bath A) shall be placed around the coil completely immersing the spiral (paragraph 5).

15. Immediately prior to sampling, the weathering tube shall be cooled and rinsed several times by filling with some of the precooled sample and discarding.

16. The cold weathering tube shall then be placed in the liquefied butanes bath (Bath B, paragraph 5) until the sample has been drawn. It is recommended the weathering tube be supported in the vacuum bottle so that approximately ⅔ of the weathering tube is immersed in the cooling bath. (See Figure 3 for details of sampling connections).

17. Place **just two grains** of new 8-14 mesh charcoal in the cold tube.

18. The weathering tube shall then be filled to the **94 ml. mark** with sample, withdrawing the liquid slowly over a period of one minute. Delivery shall be controlled by the valve on the coil outlet in order to keep full pressure on the liquid in the cooling coil.

19. The weathering tube shall then be removed from the cooling bath and supported by the neck, in a vertical position, in air.

20. The weathering test thermometer (Figure 2), previously chilled by immersion in liquefied butanes, shall be supported by means of a cork stopper in the centrifuge tube with the bottom of the bulb just above the 1.5 ml. graduation (it should be made certain that the bulb does not touch the wall of the centrifuge tube and that the mercury in the thermometer has not separated). The cork supporting the thermometer should fit tightly into the neck of the centrifuge tube so that gas may escape only from the vent hole in the centrifuge tube.

21. The sample shall be allowed to weather. In the event that the sample in the tube boils over, or is contaminated, it shall be discarded and the test repeated.

22. When the liquid in the tube has weathered down to the 90 ml. mark with the thermometer in place (about 10% evap.) the weathering tube shall be lowered into the water bath so that its tip is immersed in the water to the 1.5 ml.

graduation. Finish the analysis in this position and **do not alter the position of the thermometer (paragraph 20) or remove it from the tube at any time during the test.**

23. To facilitate reading the thermometer, smoothly swab the front portion of the centrifuge tube with glycerine to remove the frost.

24. **Observe and record** the temperature when the liquid in the centrifuge tube has weathered down to the **50 ml. mark** (approximately 50% weathered) and the **15 ml. mark** (approximately 85% weathered), **with the thermometer still in position (paragraph 20).** The thermometer shall be read when it appears that the residual volume is at the 50 ml. mark and 15 ml. mark. Quickly stop the boiling **momentarily** by placing finger over vent hole, and check the volume. **Do not cover the vent hole any longer than is necessary to read the volume.** If the sample is not yet at the desired point, allow the sample to boil again, read the thermometer, and recheck the volume.

25. For maximum accuracy, corrected weathering temperatures based upon the actual atmospheric pressure at the time of the test must be employed. The barometer is read and recorded (paragraph 11) and the two temperatures corrected in accordance with the following table:

Atmospheric Pressure mm. Hg.	Correction for Observed Weathering Temperatures °F.
770	Deduct 0.6
765	" 0.3
760	...
755	Add 0.3
750	" 0.6
745	" 0.9
740	" 1.2
735	" 1.5
730	" 1.8
725	" 2.1
720	" 2.4
715	" 2.7
710	" 3.0
705	" 3.3
700	" 3.6
690	" 4.2
680	" 4.8
670	" 5.5
660	" 6.2
650	" 6.9

Interpretation of Results

26. The percentages of propane, isobutane, and N-butane shall be estimated from the 50 ml. and 15 ml. temperatures (corrected if necessary for variations in barometric pressure) by using the weathering curves shown in Figure 5.

U. S. B. M. Lists Aviation Gasoline Stocks

December 1940 statistical report of the Los Angeles office of the U. S. Bureau of Mines lists the following aviation gasoline production and stock figures for the Pacific Coast Territory. The figures include unfinished aviation gasoline and high octane blending agents. The indicated demand figures include exports and shipments to other sections of the United States.

1940	Stocks—beginning	Production net	Stocks ending	Indicated Total Deliveries
October	1,392,000	281,000	1,432,000	241,000
November	1,432,000	443,000	1,665,000	210,000
December	1,665,000	196,000	1,623,000	238,000

(All figures in barrels)

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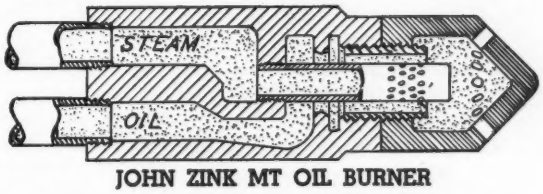

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Role of Multicolumn Fractionation

(Concluded From 2nd Issue February)

The bottoms containing only a trace of ethane and most of the propane from the feed and all of the isobutane, normal butane, isopentane, normal pentane, and heavier fractions are transferred under control of a liquid level controller at the bottom of the tower to the secondary tower which is now the depropanizer. In the latter tower propane of considerable purity can be produced overhead and reflux production is readily obtained at pressures not exceeding 200 lb./sq.in. From the bottom of the depropanizer, substantially propane-free material is again pressured under control of a liquid level controller to the debutanizer tower where the gasoline is stabilized to the final desired vapor pressure and the butane overhead withdrawn as a liquid for sale as such or blending to make commercial liquid petroleum gas.

It should be noted that it is not necessary to de-ethanize all of the wild natural gasoline. For example, the stream containing the major portion of the ethane can be subjected to the de-ethanizer treatment and the concentration of ethane in the composite feed to the depropanizer is correspondingly reduced. In most high-pressure absorption plants, the principal offender of all intermediate liquid products with respect to ethane concentration is the high pressure compressor condensate. Instead of producing this material directly to the wild gasoline accumulator as is the customary procedure, this stream can be diverted through a high pressure de-ethanizing tower, and then pressured to the wild gasoline accumulator. Stabilization of the wild gasoline for the production of propane and butane is then obtained as shown in Figure 7, and operation is identical except that difficulties with reflux formation and propane production at the depropanizer are considerably reduced.

In the introduction it was noted that there is a growing demand for isobutane and isopentane, respectively, as reactants in the production of, and blending stock for, aviation gasoline.

The production of these commodities, together with liquid gas products, presents a problem in stage fractionation of natural gasoline.

There are three basic ways in which the desired fractions can be produced by fractional distillation.

1. Stage stabilization. This consists of taking off successively lighter cuts in a series of stabilizers. The cuts made are propane and lighter, isobutane, normal butane, and isopentane. Figure 9A shows this operation schematically.

2. Isobutane-normal butane fractionation in wild gasoline followed by depropanizing of the isobutane and debutanizing and deisopentanizing of the stabilizer bottoms. Figure 9B illustrates this method.

3. Depropanizing the wild gasoline followed by debutanizing to produce butane-free gasoline, fractionating out isopentane from the latter, and separating isobutane from normal butane. Figure 9C shows this method.

Of the three processes, No. 1 and 3 in general are the most desirable procedures from the point of view of heat requirements and size of equipment. Selection, however, then depends to a large extent on the composition of the wild gasoline and the capacity of any old stabilizing equipment which might be used. In No. 3 proposal, the easy separations are made in the presence of lighter and heavier components (which as pointed out above, makes the separation somewhat more difficult) while the hard separations (isobutane from normal butane and isopentane from normal pentane) are made under as favorable conditions as possible with respect to pressure and presence of non-key components.

No. 1 proposal is only questionable in that isobutane and normal butane are separated in the presence of material heavier than normal butane making the separation somewhat more difficult than in the case of No. 3 proposal. However, No. 1 proposal eliminates the double distillation on isobutane with its consequent heat load.

No. 2 proposal makes the difficult isobutane-normal butane split in the presence of non-key components both lighter than isobutane and heavier than normal butane. The reflux ratio required for this separation is about 7-9 based on the overhead compared to 5-6 for the isobutane-normal butane split when made alone, both in 50-plate towers. In addition No. 2 proposal requires the distillation of propane twice, once as an incidental to the isobutane-normal butane split, and once in the depropanizing of the isobutane.

Table 3 presents a compilation of data on stabilizers and fractionators operating at or near their maximum capacity. The data presented include vapor loads expressed in terms of lb./hr./sq.ft. of column cross sectional area and liquid velocities at flow conditions in the downspouts. The maximum permissible mass velocities for each of the columns as calculated by the Brown equation is also presented. The Brown equation is

$$W = C\left[d_v(d_l - d_v)\right]^{1/2}$$

in which W = Maximum allowable mass velocity of vapors in the column expressed as lb./hr./sq. ft. of cross sectional area.
C = A constant which is a function of plate spacing and surface tension of the liquid in the column
d_v = Density of the vapor at the point in the column under consideration
d_l = Density of the liquid under flowing conditions at the point in the column in question.
Both dv and d_l in the above equation are expressed in terms of lb./cu. ft.

This equation was presented in Industrial and Engineering Chemistry of January, 1934 and has been been widely used in the oil industry for the determination of proper column size for various separations. The equation is a generalization derived from actual data on fractionating towers ranging from high pressure absorbers through vacuum columns, operating under conditions such that appreciable entrainment was occurring. Entrainment is of significance in such places as lubricating oil distillation where entrainment of heavier cuts may produce undesirable color in the distillate, in gasoline redistillation where entrainment of heavy material from the lower parts of the column may result in inability to meet end point specifications, and/or high gums, and in certain natural gasoline absorbers where high entrainment may result in excessive loss of absorption oil. In actual natural gasoline stabilization and fractionation, however, entrainment is generally not of appreciable importance, and for this reason the Brown equation may give values of column diameter which are quite conservative. In the appended Table 3, columns known to be operating satisfactorily shows mass velocities 20-40% greater than the allowable mass velocity which the Brown equation would indicate. This is especially true at lower pressure and higher plate spacings.

The above data are predicated on the assumption that we are dealing with a reasonably well-designed column, that is, one in which there are not obvious constrictions of either vapor or liquid flow. In general, with bubble cap columns, the above data will apply provided vapor riser area and total bubble cap slot area are not less than 8% of free cross sectional area of the column. A secondary proviso is that the bubble cap slot submergence, as determined by the height of the outlet weir on the plate, not exceed about two inches.

A safe figure for liquid velocities in downspouts is ½ ft./sec. maximum. This is figured on liquid of density corresponding to column temperature at the point in question. It should be borne in mind that under most conditions the actual material flowing in the downspouts is not a true liquid but something of a foam consisting of liquid and entrapped gas, all or a portion of which gas escapes before the liquid reaches the bottom of the downspouts. In dealing with liquids with a tendency to foam, downspouts should be very generously designed. However, for light hydrocarbons, the ½ ft./sec. velocity is an acceptable value.

Multicolumn fractionator operations can be divided into two parts: general operations and operating difficulties.

1. Flow Rate

In general it may be stated that the principal factor with respect to flow rate in the operation of multicolumn fractionators is that rates of all streams should be maintained as constant as possible. When changes in rate are required, the changes should be very gradual.

There are many ways of controlling flow, and in multicolumn fractionation most of these are applied to the control of liquid streams, such as tower feed, reflux, product withdrawal overhead, and bottoms transfer. For example, the feed rate of wild natural gasoline to the No. 1 tower in a multicolumn fractionator set-up is generally established by a flow recorder controller instrument. This consists almost universally of an orifice plate, flanges, and a manometer which measures the flow of feed to the tower. The control instrument proper acts through pneumatic transmission to a control valve which holds that rate at a predetermined value. In the case of feed pumps which are of the centrifugal type, it is customary to throttle on the discharge side of the pump with a motor valve controlled by the action of the flow recording controller instrument. In the field, where reciprocating steam pumps are used, the motor valve actuated by the flow recorder controller instrument is generally located in the high-pressure steam line to the steam pump. In the latter case the amount of steam delivered to the pump is under control of the in-

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When sweetening cracked gasoline, mixed solutizer solution (containing alkyl phenols) is used to control natural inhibitor content. U. S. Patent No. 2,223,798.

The fat solutizer solution is diluted and regenerated by being stripped of mercaptans with steam. U. S. Patent No. 2,152,724. Other patents are pending on the method used for springing dissolved gasoline to reduce loss to a minimum.

For information, write to Shell Development Company, 100 Bush Street, San Francisco.

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strument and the speed or r.p.m. of the pump varies according to whether more or less flow of liquid is required to meet predetermined rate.

The control of the reflux rate is also of prime significance in multicolumn fractionation. The control of this stream is generally in a manner identical to that for control of the feed stream. The flow recorder controller manometer is across an orifice plate in the discharge line of the reflux pump. Rate of flow is controlled by throttling with a motor valve in the pump discharge line or by controlling the rate of steam to the pump in case it is a reciprocating steam-driven type.

The rate of bottoms transfer from one tower to a second tower in a series of multicolumn fractionators is usually accomplished by a liquid level controller.

In the majority of cases it is of much importance to control rate of flow of bottoms material from the tower than it is to maintain an exact level in that tower. The liquid level controller in reality acts as a flow controller and utilizes a certain portion of the storage volume available in the bottom of the tower to iron out inequalities in the rate of production of bottoms within the tower. The bottoms are thus produced to the next tower in series in a smooth continuous stream. Liquid level controllers acting to transfer bottoms from one tower to another tower in series should have a float with a relatively long travel, so that advantage can be taken of surge volume available. Instrument type or manometer type level controllers may also be used.

2. Temperature

In control of multicolumn fractionator plants, temperature is the most widely used control variable.

Temperature within a tower or at the top or bottom of the tower is widely used as a criterion of product quality. For example, in stabilization of natural gasoline to 22 lb. Reid vapor pressure the operating control employed is almost always temperature at the bottom of the tower.

In the production of practically pure compopnents or very narrow boiling cuts from natural gasoline, top temperature is not a reliable control. It might be assumed that to produce, for example, isobutane as the overhead from a secondary tower of a multicolumn fractionator set up under a pressure of 100 lb./sq.in. gage, that by reference to the vapor pressure chart, we could determine a suitable temperature for the production of practically pure isobutane overhead. In this example the vapor pressure chart indicates the temperature corresponding to pure isobutane is 133°F. Attempting to operate with the top of the tower controlled to this temperature as a fixed reflux rate and by varying the reboiler heat input through control of the amount of steam to the reboiler will produce a product which will vary widely in composition. This is because the top temperature of the tower is the temperature of vapors leaving the tower to be condensed to form the overhead product, the quality of which it is desired to maintain. Should this temperature change, the quality of the isobutane being produced overhead to condenser and hence to the product tank if off-grade. Return of the temperature to the control point returns the overhead production to quality after the damage has been done.

A more satisfactory control for frac-

TABLE 3
MECHANICAL CAPACITY OF STABILIZERS AND FRACTIONATORS

	Unit 87 Test 2/2/32		Unit 87 Test 2/24/36		Unit 87 Test 2/24/36		Unit 87 3/2/36		Unit 87 3/5/36		Dependanizer 9/17/40 Case I		Dependanizer Unit 101 9/17/40 Case II		De-isobutanizer 12/19/40 Unit 101		De-isobutanizer 8/30/40 Unit 101	
	Found by Test	Theoretical by Brown's Equation	Found by Test	Theoretical by Brown's Equation	Found by Test	Theoretical by Brown's Equation	Found by Test	Theoretical by Brown's Equation	Found by Test	Theoretical by Brown's Equation	Found by Test	Based on Brown's Equation	Found by Test	Based on Brown's Equation	Found by Test	Based on Brown's Equation	Found by Test	Based on Brown's Equation
A. Column:																		
1. Diameter, ft.	5		5		5		5		5		3		3		6		6	
2. Cross-section area, sq. ft.	19.7	.....	19.7	.....	19.7	.....	19.7	.....	19.7	.....	7.1	.....	7.1	.....	28.3	.....	28.3	.....
3. Plate spacing, in.																		
a. Rectifying	18	.....	9–13 30″	.....	14–45 18″	.....	13–14 36″	.....	13–14 36″	.....	24	.....	24	.....	24	.....	24	.....
	.....	.....	13–14 36″	.....	.....	.....	14–45 18″	.....	14–45 18″	.....	.....	.....	.....	.....	.....	.....	.....	.....
b. Stripping	18	.....	30	.....	30	.....	30	.....	30	.....	24	.....	24	.....	24	.....	24	.....
4. Type of plate	Bubble cap	.....	Bubble cap	.....	Bubble cap	.....	Bubble cap	.....	Bubble cap	.....	Perf. plate 1-23	.....	Perf. plate 1-23	.....	Perf. plate 1-16	.....	Perf. plate 1-16	.....
											Bubble cap 24	.....	Bubble cap 24	.....	Bubble cap 16-50	.....	Bubble cap 16-50	.....
5. Trays, % of column cross-section in:																		
a. Vapor risers	8.59	.....	8.59	.....	8.59	.....	8.59	.....	8.59	.....	6.9	.....	6.9	.....	11	.....	11	.....
b. Slots of cap	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8.55	.....	8.55	.....	13.7	.....	13.7	.....
c. Perforations	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.1 trays 1-12	.....	5.1 trays 1-12	.....	8.84	.....	8.84	.....
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.65 trays 12-23	.....	4.65 trays 12-23	.....	.....	.....	.....	.....
B Maximum Loaded Tray, Above Feed:																		
1. Tray No.	30	.....	30	.....	30	.....	30	.....	30	.....	.....	.....	.....	.....	.....	.....	.....	.....
2. Vapor:																		
a. Density, lb./cu. ft.	3.6	.....	3.43	.....	3.00	.....	3.06	.....	3.42	.....	0.537	.....	0.570	.....	1.32	.....	1.34	.....
b. Rate:																		
1′. Mass velocity, lb./hr./sq. ft.	3,060	3,810	1,655	3,530	1,570	3,340	1,960	3,640	2,560	3,530	1,338	1,820	1,335	1,870	3,540	2,690	3,890	2,710
2′. Superficial velocity, ft./sec:																		
a′. Through column	0.236	.....	0.134	.....	0.145	.....	0.149	.....	0.218	.....	0.692	.....	0.650	.....	0.742	.....	0.806	.....
b′. Through vapor risers	2.52	.....	1.43	.....	1.54	.....	1.59	.....	2.33	.....	.....	.....	.....	.....	.....	.....	.....	.....
c′. Through slots	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13.5	.....	12.75	.....	8.4	.....	9.13	.....
d′. Through perforations	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3. Liquid:																		
a. Density, lb./cu. ft.	28.7	.....	26.2	.....	26.2	.....	26.2	.....	26.2	.....	38.8	.....	39.0	.....	35.3	.....	35.3	.....
b. Mass velocity, lb./hr./sq. ft.	2,980	1,655	1,330	1,200	1,480	.....	1,960	1,150	1,150	1,120	3,080	2,060	.....					
c. Downspout velocity, ft./sec.	0.37	.....	0.15	.....	0.20	.....	0.26	.....	0.0824	.....	0.0786	.....	.....	.....	0.258	.....	0.736	.....
C Maximum Loaded Tray, Below Feed:																		
1. Tray No.	3	.....	3	.....	3	.....	3	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
2. Vapor:																		
a. Density, lb./cu. ft.	3.74	.....	3.57	.....	3.25	.....	3.35	.....	3.89	.....	0.758	.....	0.561	.....	1.49	.....	1.38	.....
b. Rate:																		
1′. Mass velocity, lb./hr./sq. ft.	3,310	3,280	3,300	3,810	3,560	3,810	3,670	3,990	4,180	4,220	2,390	2,640	1,660	1,920	4,030	2,960	3,820	2,810
2′. Superficial velocity, ft./sec.:																		
a′. Through column	0.246	.....	0.257	.....	0.305	.....	0.304	.....	0.298	.....	0.773	.....	0.824	.....	0.750	.....	0.770	.....
b′. Through vapor risers	2.62	.....	2.74	.....	3.25	.....	3.24	.....	3.17	.....	11.2(PI 24)	.....	11.9(PI 24)	.....	6.77	.....	0.695	.....
c′. Through slots	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9.05(PI 24)	.....	9.62	.....	5.45	.....	0.570	.....
d′. Through perforations	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16.6(PI 13-23)	.....	17.7(PI 13-23)	.....	.....	.....	.....	.....
3. Liquid:																		
a. Density, lb./cu. ft.	25	.....	31.2	.....	31.2	.....	33.1	.....	32.4	.....	44.1	.....	41.5	.....	38.0	.....	36.9	.....
b. Rate:																		
1′. Mass velocity, lb./hr./sq. ft.	4,133	6,020	.....	6,740	.....	6,760	.....	6,360	.....	2,400	.....	1,890	.....	4,420	.....	4,130	.....	.....
2′. Downspout velocity, ft./sec.	0.58	0.52	.....	0.75	.....	0.71	.....	0.68	.....	0.0211	.....	0.125	.....	0.344	.....	0.330	.....	.....

tionation of this type is to control a temperature within the tower, say, at a point about 10 trays down from the top. This serves in effect as anticipatory control for overhead product quality. That is, heavier material which may appear on the upper trays of the column due, for example to insufficient reflux, will raise the temperature of the reference plate. By adjusting conditions such as increasing the reflux or decreasing the amount of steam to the reboiler the temperature on the tenth plate can be returned to the desired control value and the heavier material washed down the tower before it contaminates the overhead product. The actual point of control is generally determined by trial and error, and should be at a point where the temperature gradient in the tower is relatively steep. The point for temperature control can be located where the sharp temperature gradient of the top trays changes to the relatively constant temperature zone of the fractionating section. When controlling bottoms products, the point of temperature control can be where the relatively sharp gradient for the bottom trays changes to the relatively constant temperature zone of the stripping section.

3. Pressure

Pressure is required in certain cases to effect condensation of overhead for the production of reflux with available cooling water temperatures. Pressure is seldom used as a control variable, and is generally established at a certain value and other variables are used for product quality control. For example, stabilizers are generally set to operate at a fixed pressure and temperature is used as a variable for controlling the vapor pressure of the gasoline product from the bottom. A common installation for towers which are producing a liquid product overhead is an installation of the type sketched in Figure 10. This involves the use of a back-pressure regulator in the vapor line off the tower and between the tower and the condensers. Thus the tower operating pressure is fixed regardless of variations in the amount of cooling at the condensers. The major objection of this installation is the cost of the large valve required in the vapor line to the condenser. This valve must handle both the reflux and overhead product streams in the form of vapors.

With the installation of the back pressure valve in the vapor line off the tower, pressure considerations at the reflux drum are occasionally significant. It is possible with a tower operating as in Figure 10 for the vapors to be subcooled on condensation. The liquid product in the reflux drum may then have a vapor pressure well below the tower pressure. The reflux pump returns the reflux liquid from the drum to the tower, and the pressure differential to be overcome may exceed that characteristic of the pump. Under these conditions only a small amount or no reflux can be returned to the tower and fractionation is upset. As a means for avoiding this, a so-called "hot overhead by-pass line" is generally provided from the upstream side of the back pressure regulator to the reflux drum without intermediate cooling. This line is equipped with a reducing valve which opens to admit the passage of hot overhead vapor when the pressure in the reflux drum falls below a certain point. Hot gases then pass through the line and are dissolved to a sufficient extent in the reflux drum liquid to raise its temperature and hence its vapor pressure. The

TABLE 3—(Continued)

MECHANICAL CAPACITY OF STABILIZERS AND FRACTIONATORS

	Depropanizer Unit 101 8/14/40		Unit 87 Test 10/24/40 6 p.m.		Unit 87 Test 10/24/40 Midnight		Unit 87 10/26/40 Noon		Unit 87 May 9-12, 1940		Unit 87 May 13-18, 1940		Unit 87 Test May 31, 1940, 7 a.m.		Unit 87 Test June 1, 1940, 1 a.m.		
	Found Based on Test	Equation	Found Based on by Brown's Test	Equation	Found Based on by Brown's Test	Equation	Found Based on by Brown's Test	Equation	Found Based on by Brown's Test	Equation	Found Based on by Brown's Test	Equation	Found Based on by Brown's Test	Equation	Found Based on by Brown's Test	Equation	Experimental Alcohol-Water Column Found by Test
A. Column:																	
1. Diameter, ft.	4		5		5		5		5		5		5		5		1.96
2. Cross-section area, sq. ft.	12.6		19.7		19.7		19.7		19.7		19.7		19.7		19.7		3.01
3. Plate spacing, in.:																	
a. Rectifying	18		18		18		18		18		18		18		18		6 to 18
b. Stripping	24		18		18		18		18		18		18		18		
4. Type of plate	Perf. plate		Bubble cap		Bubble cap		Bubble cap		Bubble cap		Bubble cap		Bubble cap		Bubble cap		Bubble cap
5. Trays, % of column cross-section in:																	
a. Vapor risers			8.59		8.59		8.59		8.59		8.59		8.59		8.59		4.68
b. Slots of cap	3.28% Pl. 1-19																5.47
c. Perforations	4.75% Pl. 20-35																
B. Maximum Loaded Tray, Above Feed:																	
1. Tray No.																	
2. Vapor:																	
a. Density, lb./cu. ft.	1.97		3.58		2.52		2.57		2.88		2.82		2.72		2.73		
b. Rate:																	
1'. Mass velocity, lb./hr./sq. ft.	1,340	3,070	1,830	3,880	2,530	3,640	2,390	3,670	1,250	3,880	1,130	3,660	2,160	3,780	2,250	3,780	
2'. Superficial velocity, ft./sec.:																	
a'. Through column	0.180		0.142		0.279		0.258		0.121		0.113		0.221		0.229		
b'. Through vapor risers			1.66		3.24		3.01		1.41		1.32		2.67		2.67		
c'. Through slots	0.712																
d'. Through perforations																	
3. Liquid:																	
a. Density, lb./cu. ft.	31.7		31.4		35.3		35.3		35.3		35.6		35.0		35.3		
b. Mass velocity, lb./hr./sq. ft.	1,090		1,460	1,690	1,990		2,020		676		745		586		2,210		
c. Downspout velocity, ft./sec.	0.101		0.1630		0.197		0.20		0.0674		0.0734		0.0686		0.220		
C. Maximum Loaded Tray, Below Feed:																	
1. Tray No.																	
2. Vapor:																	
a. Density, lb./cu. ft.	2.78		3.65		3.55		3.49		3.53		3.60		3.44		3.42		
b. Rate:																	
1'. Mass velocity, ft./sec.	2,250	3,860	731	4,430	2,700	4,660	2,450	4,600	2,190	4,580	1,800	4,610	3,170	4,520	3,070	4,530	
2'. Superficial velocity, ft./sec.:																	
a'. Through column	0.228		0.0556		0.212		0.265		0.172		0.139		0.256		0.250		
b'. Through vapor risers			0.648		2.46		3.09		2.0		1.62		2.98		2.90		
c'. Through slots																	
d'. Through perforations	4.80																
3. Liquid:																	
a. Density, lb./cu. ft.	38.2		37.0		40.1		41.2		40.4		41.5		40.0		40.8		
b. Rate:																	
1'. Mass velocity, lb./hr./sq. ft.	3,840	1,375		4,690	4,400	3,460	3,170	4,720	4,410								
2'. Downspout velocity, ft./sec.	0.0291	0.130		0.410	0.375	0.301	0.278	0.415	0.378								

Maximum Loaded Tray, Below Feed	Loading in % capacity at plate spacing shown and 1" of liquid Plate Spacing, 6"	12"	18"	18", Mass velocity according to Brown's Equation
1. Tray No.				
2. Vapor:				
a. Density, lb./cu. ft.	0.087	0.087	0.087	0.087
b. Rate:				
1'. Mass velocity, lb./hr./sq. ft.	423	659	1,410	2,040
2'. Superficial velocity, ft./sec.:				
a'. Through column	1.35	2.10	4.5	6.5
b'. Through vapor risers	27.5	42.7	91.6	132.0
c'. Through slots	23.3	36.2	77.6	112.3
d'. Through perforations	577		1,150	
3. Liquid:				
a. Density, lb./cu. ft.				
b. Mass velocity, lb./hr./sq. ft.				
c. Downspout velocity, ft./sec.				

1.—With 10-15% entrainment.

FIGURE 7

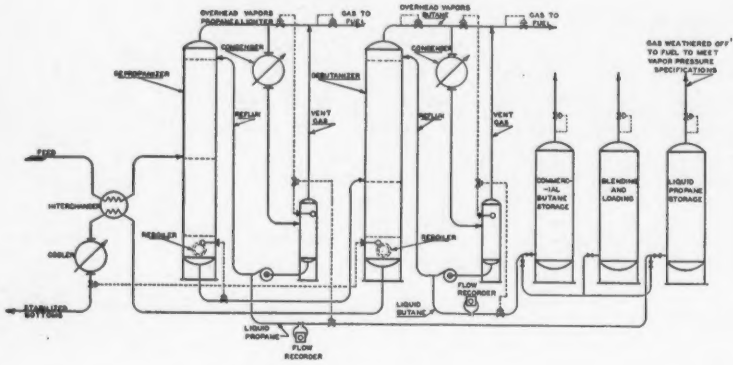
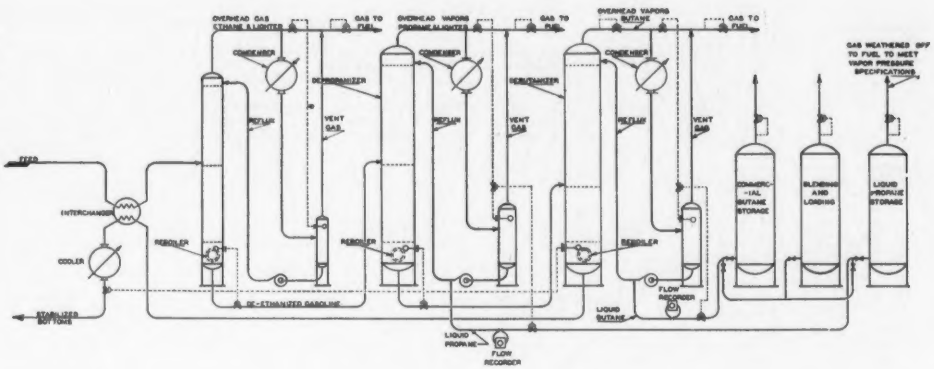


FIGURE 8



pressure reducing valve then shuts off and the reflux system operates satisfactorily.

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2. Huntington, R. L., Refiner, **19**, Jan.-Dec., 1940.
3. Robinson, C. S. and Gilliland, E. R., Elements of Fractional Distillation, McGraw-Hill, 1939.
4. Bowman, California Natural Gasoline Association, May, 1939 meeting.
5. CNGA Liquefied Petroleum Gas Standards, 1939.
6. Brown, G. G., Souders, Mott, Jr., Nyland, H. V., and Hesler, William W., Ind. and Eng. Chem., **27**, April, 1935.

FIGURE 9A
METHODS OF NATURAL GASOLINE FRACTIONATION

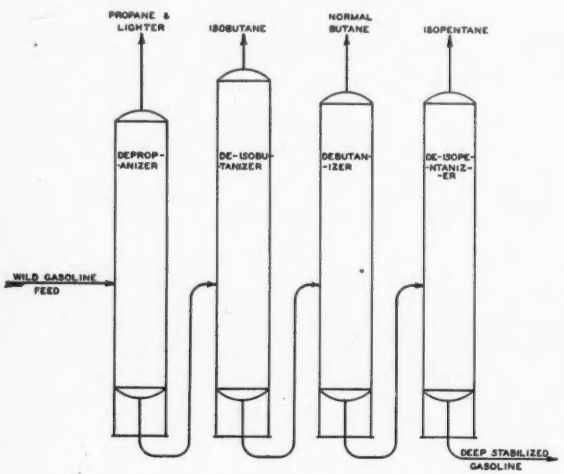


FIGURE 9B

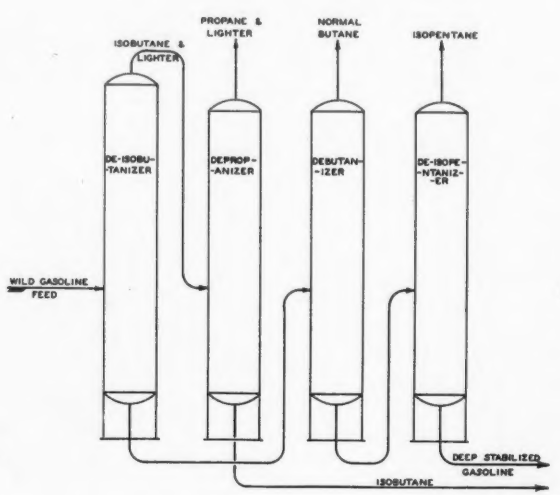
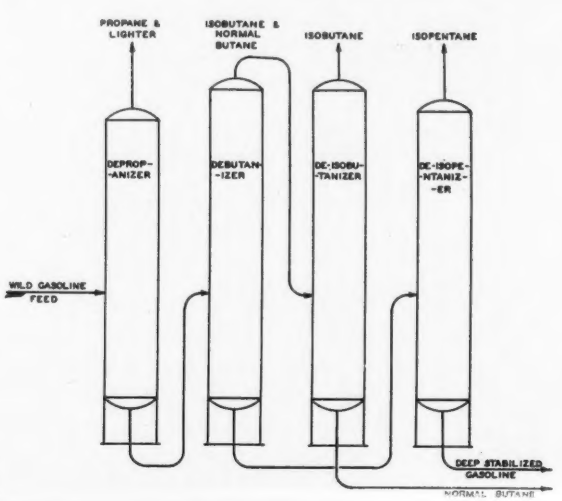


FIGURE 9C



CALIFORNIA OIL WORLD AND PETROLEUM INDUSTRY, SECOND ISSUE, MARCH, 1941

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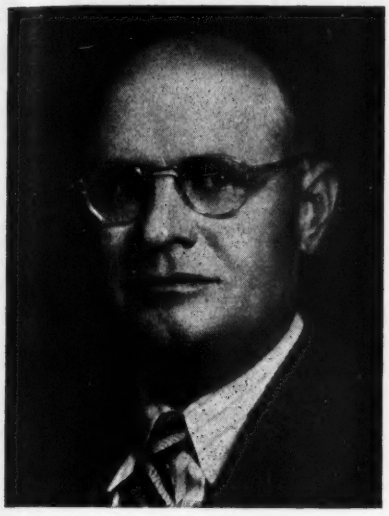
J. E. Aderhold, Jr. On Extended Trip

Joseph E. Aderhold, Jr., president of Allied Supply Co., left the latter part of March for an extended trip East.



Joseph E. Aderhold, Jr.

Joe Aderhold is making this trip to acquaint himself with the plants of the various companies whose lines Allied Supply Co. represent in oil field sales to California operators.

According to the present itinerary, Mr. Aderhold will visit the plants of the following companies:

American Cable Company, Wilkes-Barre, Penna.; Bethlehem Steel Company, Bethlehem, Penna.; Chain Belt Company, Milwaukee, Wisc.; Everlasting Valve Company, Jersey City; Manning, Maxwell & Moore, Bridgeport; William Powell Company, Cincinnati; Tube-Turns, Inc., Louisville, and Watson-Stillman Company, Roselle, N. J.

New Franks Derrick Meets State Road Laws

James C. Kelley, sales representative of Hillman-Kelley, Inc., California distributor of Franks Manufacturing Corp., has returned to Los Angeles from Tulsa, where he has been advising James Moon, Franks design engineer, on California road laws.

As a result of the conferences in Tulsa, Mr. Moon has designed a complete trailer mounted well servicing unit with integral open faced derrick capable of servicing 8500-ft. wells (with 3-in. tubing) and provided with a propeller shaft rotary drive and rear end rotary counter shaft for shallow slim hole drilling.

This new unit, completely loaded with line and blocks, string, guy lines, hook and 1000 lbs. of miscellaneous equipment, with 10,500-lb. truck, weighs approximately 62,500 lbs., with the load distributed in such manner as to make it possible for the unit to traverse California highways without a special permit.

The derrick on this unit has a removable hinge joint feature allowing the ready removal of the hoist and trailer from the derrick while standing and the subsequent use of the hoist under conventional derricks. This complete unit was designed and built by the makers of the original patented open-faced telescoping derricks now performing successfully in all parts of the United States and foreign countries.

The derrick has a 200,000-lb. gross load capacity, which includes loads due to live load, guy line, 70 MPH wind on derrick and pipe and pipe set back, all acting simultaneously. Factor of safety with the above loading, assuming perfect guy wire conditions (that is, four lines from crown block) is 3.34.

Franks 200,000-lb. derrick is built of X4130 chrome-molybdenum tubing. The lower section is of electrically-welded one-piece construction. It is tapered with tubular steel legs and built in guide section, which serves as guide for upper section, increases leg capacity, and increases torsional rigidity of the entire derrick. The use of tubes instead of angles, provides greater strength with less weight and enables the structure to sustain more abuse, according to Mr. Kelley.

James C. Kelley

BJ Elliott Core Drilling Equipment

Byron Jackson Co. announces the appointment of the Jack Smith Oil Field Service as exclusive representative for BJ Elliott Core Drilling Equipment in the State of California. Previously International Cementers, Inc. performed this service.

Jack Smith

For complete information and prompt service call the Jack Smith Oil Field Service, Telephone KImball 9137, or address Box 2017 Terminal Annex, Los Angeles, California.

Vernon Tool Sells Job Shop Facilities

Vernon Tool Co., Ltd., Los Angeles, announces the disposal of its general machine and contract job shop facilities and business. The company will continue in its regular line of Oil Field equipment and Western Diesel and Gas engines. Vernon products are: McNeely-Vernon Vibrating Mud Screens, Corwin-Vernon Desanders, Suter-Vernon Hydraulic Pumps, Vernon Precision Tool Joints, Knowlton Packers and Liner Hangers, Western Diesel and Natural Gas Engines and Parts.

Ward Blackburn remains as president of Vernon Tool Company, Ltd., and complete sales and service facilities will be maintained. The company remains at its present location with the same executives and personnel. It has a large stock of parts for the above-mentioned equipment ready for use.

Ralph N. Brodie Co. Moves Headquarters

O. E. Dustman, district manager for the Ralph N. Brodie Co., Inc., has announced the new location for the company's Southern California headquarters at 2101 S. San Pedro St., Los Angeles. The new phone number is PRospect 2274.

Field Development

Los Angeles Basin

West Wilmington Activity Increases

With Acoma Oil Co. and Silver Petroleum Co. wells demonstrating the commercial possibilities of the West Wilmington area, other operators are preparing to get on the bandwagon. Los Angeles Basin Petroleum Co. has derrick up for Phillips No. 1 while De Marsh Oil Co. is ready to rig up its first well on the Phillips property. Silver Petroleum Co. has material on the ground for its second well and Acoma Oil Co. plans to get under way soon on its No. 2.

The present Silver and Acoma wells are reported to be producing about 75 bbls. of 19 gravity oil each.

Morton & Elder Start New Santa Fe Project

Morton & Elder recently acquired the drilling rights on The Texas Co.'s old Mattern properties at Santa Fe Springs and will start work immediately on the first of a series of new wells. Location for the initial project has been staked 110 ft. north and 525 ft. west of the intersection of Gardner Ave. and Norwalk-Puente Mills Road.

Axis Petroleum Co. is redrilling JALK No. 8 at 3800 ft. to recomplete in the Meyer zone and Union Oil Co. is rigging to pump Bell No. 77 after deepening to 5584 ft.

Improved Weather Favors Newhall-Castaic

Generally improved weather conditions during the past two weeks have been of material benefit to operators in the Newhall-Castaic region allowing them to resume development work which had been virtually halted by the rains.

On the north flank of Pico Anticline in sec. 6,3-16, Aztec Oil Co. is preparing to spud its important test well on the Sanborn property. Production will be sought in the Modelo section of the Miocene which is expected somewhat shallower than in the nearby Newhall-Potrero and Del Valle fields. It is the belief of the operators that 6000 ft. should penetrate the productive horizons.

After much unavoidable delay, Barnsdall Oil Co. is ready to get the drill pipe spinning in Honor Rancho No. A-17-1 in the southwest corner of sec. 5,4-16, a mile northeast of Castaic. Objective formations of this test have not been revealed but it may be assumed that the hole will be carried to an adequate depth.

Four miles northerly from the Beacon and a mile off the highway to the west, Morse-Mangold, Inc. is drilling McDermott No. 1 with prospects of finding production in the Modelo at relatively shallow levels. Location is in sec. 26,

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Rankin & Williams	1	7, 3-13	9098	Idle
	Barnsdall Oil Co., Honor Rho A-17-1		5, 4-16		Rigging up
Castaic	Colter, R. T., Explor.	1	8, 4-17	1350	Idle
	Hathaway Co., Ram	1	31, 5-17		Rig
	Jasper, Fred S.	1	17, 4-17		Grading roads
	Morse-Mangold, Inc., McDermott	1	27, 5-17		Rigging up
	Western Gulf Oil Co., Lechler	2	31, 5-17		Rig
	Worland Oil Co., Jenkins-Owens	1	18, 5-16	2940	Idle
Dominguez, West	Hiles Drilling Co., Grant	1	29, 3-13	7660	Cleaning out
Malibu	Sovereign Oil Corp., Malibu	1	7, 2-18	4685	Drilling
Newhall	Aztec Oil Co., Sanborn	1	6, 3-16		Rig
	Purman, Thos. H. T., Needham	1	13, 3-16		Grade
	So. Calif. Drlg. Co., Needham	4	13, 3-16	4398	Idle
	The Texas Co.	1	14, 3-16		Grading
Redondo	Pettijohn, J.E., Dominguez Estates	1	5, 4-14		Grade
	Orange County				
Costa Mesa	Thompson, Milton N., Banning	1	9, 6-10	5649	Idle
Kraemer	Valley Petroleum Co., Kraemer	1	25, 3-9	604	Idle
Olive	Tide Water Assoc. Oil Co., Olive-Orange	1	19, 4-9	1250	Drilling
	San Bernardino County				
Carbon Canyon	May, Homer, Oasis	1	31, 2-8		Rig
Chino	Prado Oil Corp., Lamp	1			Bldg. rig

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Contra Costa	Lafayette Oil Co., Morris	1	28, 1n-2w		Rigging up
Humboldt	Daly, M. B., Jr.	1	2, 1n-2e	900	Idle
Merced	Don Pedro Oil Co.	1	9, 6s-9e	1906	Idle
Mendocino	Keyt, N. F.	1	3, 12n-17w	300	Drilling
Monterey	Loma Grande Oil Co., Corey	1	23, 24s-10e	2175	Idle
	Priest Valley Pet. Co., Greve	1	22, 20s-12e	2885	Idle
Rio Vista	Amerada Pet. Corp., J. F. Wilcox	1	31, 4n-3e	30	Drilling
Sacramento	Harkness, Tracy	1	35, 8n-4e		Rig
San Joaquin	Standard Oil Co., Blewett	2	25, 3s-6e		Rig
San Mateo	Ra-Lite Petroleum, Inc., Bell	5	16, 7s-4w	1200	Idle
Yuba	Wright, L. G., Cox	1	18, 14n-5e	1795	Idle

5-17.

With Western Gulf Oil Co. now actively preparing to drill Lechler No. 2 in sec. 31,5-17, the productive ability of Oak Canyon will soon be given a second trial. No. 1, finished in the Modelo at 2400 ft., pumps about 40 bbls. of 23 gravity oil per day. Plans for a deep test are held in abeyance pending a test of No. 2 in the shallow zone.

Hathaway Co. is offsetting the Lechler lease to the south with Ram No. 1.

On the east flank of the Newhall-Potrero field, Newhall-Potrero Oil Co. is deepening Ferguson No. 1 another 1000 ft. if necessary below old bottom at 8000 ft.

The Texas Co. is grading roads and rig site for Whitnah No. 1, location for which has been surveyed in sec. 14,3-16 near where British American Oil Producing Co. drilled Edwina No. 1 last year.

Wilmington Completions Maintain Good Average

Recent completions at Wilmington maintain the good average set during the four year life of the field. During the past two weeks six new wells have been brought in and three old wells were again placed on production after being redrilled in the oil zone.

Probably the best of the lot was Union Pacific Railroad Co.'s No. E-30 on property of the Southern California Edison Co. which was finished with the Lower Terminal zone open at intervals from 3521 to 3930 ft. flowing 80 bbls. a day through a very small orifice. Typical of the area, gravity of the oil was 31 degrees and the water content was less than 1.0%.

Union Pacific completed two more wells on its large holdings in the center of the field, the largest of which was No. 174 which flowed 220 bbls. of 29 gravity oil from the Ranger and Upper Terminal zones. A fault was intersected at 3500 ft. so the hole was not carried to the Lower Terminal. The company's No. 169 was finished in the Ford zone at 5456 ft. flowing 200 bbls. a day with a 3.0% cut.

Long Beach Oil Development Co.'s "W" No. 26, located on Terminal Island near the new Navy Base, is flowing 150 bbls. a day through a 21/64 in. bean from the Lower Terminal and efforts are being made to produce a flow from the Upper Terminal.

At the intersection of Banning and Anaheim Blvd., Atlantic Oil Co. completed its No. 19 at 3550 ft. pumping an estimated initial rate of 200 bbls. The liner is perforated in two intervals below 2611 ft.

North and west of the intersection of "G" and Pioneer Sts., Vulcan Oil Co.'s No. 469-2 was finished on the beam with no accurate production estimates available immediately. Total depth was 3300 ft.

Redrilling his old No. "W"-2 to 3565 ft., D. D. Dunlap installed a pre-pack type liner and recompleted pumping 200 bbls. a day with a 4.0% cut. The well is located north and west from the corner of Banning and Anaheim Blvd.

Two other redrill projects were recompleted on the pump but with no production figures available. They were Macson Oil Co. No. "G"-1 at Denni and Avalon and Wilmith Petroleum, Inc. No. 2 at "L" and Broad Sts.

Drilling activity remains fairly constant throughout the field and a number of the older wells are being redrilled to install gravel packed liners.

Montebello Well Flows 390 Bbls.

Deepened 65 ft. to 7705 ft., Union Oil Co.'s Wilcox No. 7 at West Montebello was recompleted flowing initially at a 390 bbls. per day rate through a 33/64 in. bean. Gas rate was 425,000 cu. ft. After seven days the well was flowing 324 bbls. cutting 3.7% and 480,000 cu. ft. of gas.

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See Composite Catalog.

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Leading Oil Companies are saving 10% to 30% and more on the NET COST of their Workmen's Compensation by placing their Insurance with the Industrial Indemnity:

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Address _____

Bottomed previously at 7640 ft. with 7 in. casing at 7400 ft. and 5½ in. liner cemented through perforations at 7555 ft., the hole was deepened and a 4 in. liner run to 7705 ft. The 7 in. casing was then perforated in two intervals below 7060 ft. and the 5½ in. perforated from 7405 to 7505 ft.

Kern Oil Co.'s latest completion, Monterey No. 44, is flowing 353 bbls. a day of oil and 22 bbls. of water from the Seventh and Eighth zones. Total depth is 7755 ft.

In attempting to improve production in Taylor No. 3, Kern Oil Co. set a bridge plug in the 7790 ft. hole at 7405 ft. and is perforating and testing various levels. With four holes open at 6950 ft., the well flowed 630 bbls. of oil and 320 bbls. of water.

Signal Southwest Finish Huntington Beach Wells

Good wells were recently finished at Huntington Beach by Signal Oil & Gas Co. and Southwest Exploration Co., the largest being the former company's No. 2-A on the Bolsa lease. Bottomed at 4725 ft., and equipped with a Kobe fluid operated pump, the well produces 498 bbls. of 29 gravity oil daily. Signal-Bolsa No. 23-A has just been placed on production and No. 2 is in its final stages.

Southwest Exploration Co.'s No. 36, finished at 5141 ft., is producing 230 bbls. of 23.5 gravity clean oil daily. No. 37 is drilling at 3800 ft.

Harold C. Morton's No. 2, located on the old Tide Water Associated Oil Co. Fowler lease, is now below 4000 ft. and scheduled to be finished near the 4600 ft. level.

Attempting to make a producer of the long abandoned Standard Oil Co. No. "G" 2 east of the sugar factory, Blake & Frampton cleaned out to 3700 ft. and are bailing with perforations open below 3650 ft.

Union Completes West Dominguez Well

Indicating that westerly limits of Dominguez production are not yet reached, Union Oil Co. brought in Austin No. 7 flowing 761 bbls. of 32 gravity clean oil and 592,000 cu. ft. of gas through a 24/64 in. bean. The well produces 100 ft. of the Seventh Callender zone above 7206 ft. Location is 1300 ft. west of Avalon Blvd.

East of Avalon Blvd. and on the north flank of the field, Union finished Callender No. 82 at 7100 ft. flowing 115 bbls. a day with an 8.8% cut. The company is preparing to drill three new wells, two on the Callender and one on the Austin property.

Shell Oil Co., Inc. in drilling Reyes No. 112 below 6300 ft. and has locations staked for Nos. 113, 114 and 115.

Hiles Drilling Co. is still attempting to produce the old Pongratz-Grant No. 1 west of the field.

So. Cal. Pet. Cores Athens Outpost Well

Tightest hold out well in the Los Angeles Basin is Southern California Petroleum Corp.'s Howard Townsite Owners No. 1 at the southwest corner of 122nd St. and Vermont Ave. A large sign at the rig reads "This is a no dope well, please keep out", and they really mean it. Usually genial company officials refuse all comment and are simply "not in" to those whom they suspect of seeking information.

Nevertheless, the depth is known from the number of drill pipe stands to be close to 8200 ft. and observers report that nearly 90 wire-line cores have been pulled. Rumor has it that an oil sand interval similar in quality to that productive in the Thorley well was cored near 8000 ft. and that if nothing better is found, the hole will be plugged and a production test made.

If Southern California Petroleum obtains a commercial yield, the Athens field will be extended a quarter of a mile to the west of present limits.

Potrero Well Flows 350 Barrels Daily

Basin Oil Co.'s latest Potrero completion, No. 12, is now flowing 32 gravity oil at the rate of 350 bbls. a day, having built up from a 300 bbls. initial. Casing was cemented on bottom at 3682 ft. and gun-perforated at intervals.

New Outfit Drills Newhall-Potrero Well

On its maiden voyage at Newhall-Potrero is Barnsdall Oil Co.'s new super sparkplug rig recently purchased from National Supply Co. Designed for 11,000 ft. or deeper, the outfit should make a short job of R.S.F. No. 19 which will be bottomed at approximately 7300 ft. Next to go on production will be R.S.F. No. 18, now drilling below 7000 ft.

East of the present field limit, Newhall-Potrero Oil Co. is deepening Ferguson No. 1 at 8450 ft.

Engineering, Technology, latest news—twice a month in California Oil World.

San Joaquin Valley

Richfield Quits Grapevine Test

Richfield Oil Corp.'s exploration hole on Tejon Ranch holdings, a portion of the company's vast south Valley acreage, has been abandoned in siltstone at 10,940 ft. Known as Tejon Ranch No. 1, the well was drilled near the west quarter corner of sec. 2, 10-19, southeast of the small productive Grapevine pool.

Believed to have bottomed in Eocene, the try was the first to penetrate to depth in the area. No petroleum showings were reported in any interval.

Preparations to drill a closure defined through applied geophysics is under way by the Continental Oil Co. Roads are being graded in to the site of Tejon No. A-1 near the east quarter corner of sec. 28, 11-19, due north of the pool.

Still idle after high winds demolished the wood rig over its Grapevine wildcat, Kern Line Oil Co. is planning to resume work on its 8390 ft. hole in sec. 19, 11-19. This project was deepening after showings tested at 8290 ft. produced only brackish water and a trace of gas.

Hancock Misses Sand In Union Ave. Well

Hancock Oil Co.'s second well on the Roberts property in sec. 6, 30-28 at the south flank of the City of Bakersfield was abandoned at 5203 ft. in gray sand. Located only 660 ft. east of the discovery well, which resulted in a 180 bbl. pumper, the current try apparently bottomed east of a fault. Only minor showings were encountered in the zone where productive sands were expected.

Company officials have not yet decided on succeeding operations although a redrill job on No. 2 may be undertaken to whipstock westerly through the fault into the producing zone.

If and when a third well is undertaken the site will probably be 660 ft. south of the discovery well. Short distances between locations will be the rule for development here since the productive area is generally believed to be small.

2nd Driller Planned For McClung District

Ohio Oil Co. is building rig for KCL No. G-1 near the center of sec. 36, 29-26, southeast of Greeley and but 2 miles northeast of Union Oil Co.'s Vedder test, KCL No. 31-3 in sec. 3, 30-26.

The new project is located northeast of the general trend which has been heavily drilled in late years, said trend being a line drawn southeasterly through the Rio Bravo and Greeley fields. These fields are productive in the Vedder and are high points of the same trend on which Union is now seeking a closure.

At last report the Union try was drilling in shale at 7500 ft. and is coring for the Stevens zone which proved momentarily productive in Superior Oil Co.'s KCL No. 9 in the same section during 1937. This well flowed clean 33 gravity oil for a few hours before mud broke in and killed the well, production which has never been relocated in subsequent Stevens zone tests.

It is possible that if the zone appears saturated here tests will be made before drilling on to the objective Vedder zone which has been found in previous drilling in the section near 11,125 ft.

Shafter Deep Try Has Hard Luck

Continental Oil Co.'s latest Shafter area deep try, KCL No. C-2, is plugged at 9940 ft. to sidetrack a drill pipe fish after hitting 11,349 ft. A protective string of 8⅝ in. casing is standing cemented at 9770 ft. to prevent further loss when redrilling operations begin.

Located near the north quarter corner of sec. 35, 27-24, the current try is the latest of a series of 13,000 ft. holes seeking production along a trend drawn southeasterly from the Wasco field to the axis of the Rio Bravo and Greeley fields.

Slight oil showings have been found in prior drilling along the play but none has found a high point which will yield the long sought high gravity Vedder production believed to exist in the area.

Terra Bella Job Again Drilling

V. F. Arnold's Terra Bella Irrigation District No. 1 in sec. 5,23-28, southeast of the town of Terra Bella, has resumed drilling. Planned as a shallow test of Vedder sands the well at last report was in a hard formation at 135 ft.

C. C. M. O. Abandons Pyramid Hills Try

Failing to find production near the Tide Water Associated Oil Co.'s 1940 Pyramid Hills discovery, Chanslor-Canfield Midway Oil Co. abandoned Bocqueraz No. 1 in sec. 17,24-18 at 1246 ft.

Top of a fair looking sand zone believed to be the upper Kreyenhagen was found at 765 ft. while the top of the Cretaceous shale was marked at 1181 ft. A series of tests through this member of the Kreyenhagen all proved wet and the well was hung up.

Two other tries at production in the

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
	Fresno County				
Cantua Creek	The Texas Co., S. P.	27–13	13, 17-15	9673	Testing
	Kern County				
Belridge—South	Santa Mora Oil Co.	1	10, 28-20	544	Re-bldg. rig
Buttonwillow	The Texas Co., S. P.	47–15	15, 29-24	8122	Drilling
Devils Den	Herzog, R. D., Collins	1	26, 25-18	340	Idle
	Herzog, R. D., Marine	1	26, 25-18	708	Idle
Edison	Crude Oils, Inc., S. P.	7	31, 29-30	460	Idle
	Kern Valley Drlg. Co., Williams	1	30, 30-30	530	Idle
Grapevine	Continental Oil Co., Tejon	A-1	28, 11-19		Grading
	Kern Line Oil Co.	1	19, 11-19	8390	Idle
	Richfield Oil Corp., Tejon Ranch	1	2, 10-19	10940	Abandoned
Lost Hills	Tide Water Assoc. Oil Co., Isolis	46	16, 27-21		Location
Maricopa	Bankline Oil Co., Well	24–24	24, 11-23	2915	Drilling
McClung	Ohio Oil Co., KCL	G-1	36, 29-26		Rig
	Union Oil Co., KCL	31–3	3, 30-26	7475	Drilling
Richgrove	Borget, A. J., Kendall	1	16, 25-27	1108	Drilling
	Copeland, F. B., Thomas	1	15, 26-27	2822	Abandoned
	Shell Oil Co., Smith	77–11	11, 26-27	87	Drilling
Shafter	Continental Oil Co., KCL	C-2	35, 27-24	11349	Redrilling
Union Avenue	Hancock Oil Co., Roberts	2	6, 30-28	5203	Suspended
	Kings County				
Kettleman So. Dome	Bristol Oil Co., Smith	1	35, 24-19	8054	Testing
Pyramid Hills	Chanslor-Canfield Midway Oil Co., Bocquarez	1	17, 24-18	1245	Abandoned
	Pyramid Prod. Co., Spreckles	2	16, 24-18		Rig
	Tide Water Assoc. Oil Co., West Slope	76	20, 24-18		Rig

area are planned with Tide Water Associated Oil Co.'s West Slope No. 76 drilling in sec. 20,24-18 and Pyramid Prod. Co. having a rig up in sec. 16,24-18.

Edison Area Again Active

The Edison area of Kern county, long semi-dormant is again relatively busy. Latest important development was another of Wood-Callahan's substantial completions in the southwest section of the area. Reported to be pumping a considerable amount of oil, little is known concerning the finishing of Heyden No. 2 in sec. 21,30-29.

Kenneth Oil Prod. Co. is preparing to drill well No. 2 as an off-set in the same section while Vendome Oil Co. has staked location for well No. 1 in sec. 22,30-29.

In the Edison area proper, Monterey Exploration Co. deepened Shell-Duff No. 15 from 1731 ft. to 3520 ft. topping the Schist basement at 3518 ft. Plugged to 3320 ft., and with a string of 7 in. casing cemented at 3260 ft. the project is preparing to try sands in the open interval. The well was originally finished for a small yield of heavy, wet oil from oil sand and shale cored from 1656 to 1731 ft.

Ten Section Wells Get High Potentials

Shell Oil Co.'s privately controlled Ten Section field continues to produce high initial completion. Latest of the good producers is KCL No. A-87-30 which finished at 8210 ft. for 1673 bbls. of 35.5 gravity clean oil with 4,038,000 cu. ft. of gas.

Other recent completions were given potential tests resulting in 2333 bbls. for KCL No. A-47-29 and 2212 bbls. for KCL No. A-63-29.

Shell is running five strings in the area with a program intended to drill up present proved limits in exact accordance with drilling requirements. Several locations have been staked ahead of the drill.

Amerada Well Finds Coalinga NE Limits

Amerada Petroleum Corp.'s S.P.L. No. 37-17B, near the center of the southwest quarter of the discovery section 17, 19-16, definitely established the easterly limits of the Coalinga Northeast field production when many attempts to produce the top of the Gatchell sands were unsuccessful and the well was abandoned.

Originally bottomed in Cretaceous at 9511 ft. the well was plugged back for tests of the Gatchell. Top of the zone or "EGA" point was marked at 8223 ft. with the base or "EGZ" point found at 9024 ft. but only a few feet at the top showed oil.

Repeated perforations and tests proved that the section was too low to be clean, a condition indicated when the "EGA" was found more than a hundred feet lower than No. 28-17 B.

Another well having definite bearing on field limits is Pure Oil Co.'s Schwinn No. 2, one of the most westerly in sec. 30, 19-16. Whipstocked to the east from its surface location 1100 ft. northwest of the center of the section, the hole was bottomed at 8326 ft. after coring the Gatchell sand from 8272 to 8319 ft. A blank liner was cemented on bottom and gun-perforated but only a small heading flow has been obtained so far.

At the north end of the field, Standard Oil Co. finished No. 88-7B in 70 ft. of Gatchell sand at 8200 ft. flowing 2544 bbls. of 27 gravity clean oil through a 36/64 in. orifice. Gas production was 1,320,000 cu. ft. a day.

In the east half of sec. 30, 19-16, Bandini Petroleum Co. is nearing the pay zone in No. 56-30B and is reconditioning No. 71-30B. Wilshire Annex is preparing to run casing in No. 54-30B.

Seeking to extend the field to the south, Standard Oil Co. is preparing to drill Nos. 31, and 41 in sec. 31, 19-16. These wells are one more step in linking the Northeast field with the original Eocene Pool to the south.

Tide Water Plans Lost Hills Try

A mile and a half south of the south tip of the Lost Hills field, Tide Water Associated Oil Co. is preparing to drill Isolis No. 46 in sec. 16, 27-21.

Comparatively little drilling has been done in the area, although Tide Water has previously sought production immediately south of the current try. A few shallow tests were drilled on adjoining acreage in the early days of Valley development.

Good Wells Finished In Coalinga Eocene Pool

Three good wells were completed during the past two weeks in the Coalinga Eocene Pool by as many different operators. Superior Oil Co. brought in Cagle No. 6 for 1320 bbls. while Standard Oil Co. finished No. 53-19F for 1830 bbls. and R. S. Lytle obtained 2410 bbls. in No. 64-18F.

THE SPIRIT OF 76

by JOHN CLINTON

* * *

From now on you can call me Shock-Proof John. I've seen *everything!* Because the other morning when I was driving past the Union Oil station on the corner I almost fell out of my Hispano-Plymouth at what I saw.

* * *

There, drawn grandly up to the pumps was a horse and wagon! "This, I gotta see!" says I, and turned back. And when I returned I got the 2nd shock, for what do you think the hay-burner was doing?

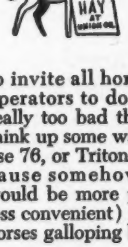
* * *

Well sir, the driver had put four old auto wheels on his wagon, and he was having the tires filled with air! While he was doing it, one of the boys had put a bucket of water down for Dobbin to drink! It was the most unusual sight I've seen for years!

* * *

And while the situation was, to say the least, amusing, the boys at the station were doing their stuff with perfectly straight faces. I'm not sure just what the entire significance of this little drama was, but it certainly proves that the Union Oil boys are gentlemen from way back!

* * *



So, in addition to inviting you to drive your car into a Union Oil station for service, I'm now in a position to invite all horse-and-wagon operators to do likewise. It's really too bad that Union can't think up some way for horses to use 76, or Triton Motor Oil, because somehow I think life would be more picturesque (if less convenient) if we had more horses galloping by. Don't you?

UNION OIL COMPANY

Coastal District

Santa Maria Valley Has Lone Drilling Well

Only one well is actively drilling in the Santa Maria Valley at the present time, Union Oil Co.'s Nicolai No. 2 in sec. 28, 10-34. The company's last two projects, Fleisher No. 1 and Stinson No. 2 have given some trouble and are not yet on settled production.

In an effort to eliminate water, Pacific Western Oil Corp. has plugged Samarin No. 3 from 4904 ft. to 4685 ft.

Rincon Deep Test Finds Oil at 6600 Ft.

Although little information has been released by Chanslor-Canfield Midway Oil Co. on its Rincon deep test, Hobson No. C-9, reports have been received that a core at 6600 ft. contained a fair percentage of oil sand. Drilling was not stopped, however, and bottom is now below 5700 ft.

C. C. M. O.'s Hobson No. B-16, a deepening job, was recompleted on the pump for 100 bbls. cutting 10.0%. Present depth is 4800 ft. No. B-44, a new well, is drilling at 2650 ft.

Ventura Avenue Development Active

Development activity continues strong in the Ventura Avenue field where twenty projects are in various stages from grading location to completing. Independent companies are well represented by Alliance Petroleum Corp. which is drilling two wells, British-American Oil Producing Co. which is preparing to build a rig for Hartmann No. 12 and Lloyd Corp. which has one well coring oil sand below 9000 ft. and is preparing to drill another.

Among the major companies, Tide Water Associated Oil Co. is presently the most active with eight projects under way. The company's last completion was V.L.&W. No. 36 which came in for 3600 bbls. of clean oil from 9780 ft. Shell Oil Co., Inc. has three wells drilling and is preparing to spud three more.

Ventura Wildcatters Resuming Activity

With good weather following weeks of heavy rains, wildcat operators throughout Ventura county are resuming work after clearing away landslides and repairing washouts in their mountain roads.

In the Sespe country, W. E. McCaslin has rigged the 2000 ft. Irene Riley No. 1 with rotary equipment and is preparing to clean out and make a bailing test. The well will be deepened if necessary to get production.

Havlin & Pottenger are drilling below 900 ft. in Alice No. 1 in Eureka Canyon, and Intercounties Fuel Co. has resumed drilling its well near Fillmore.

F. E. Fairfield of Long Beach has tentative plans for drilling the Robertson property in sec. 12, 3-20 at Bardsdale.

South Mountain Oil Co. suspended operations at 2600 ft. in its outpost well on the south flank of the South Mountain field but is expected to get going again within a few days.

Continental Drills At San Miguelito

Continental Oil Co.'s Grubb No. 22 at 5700 ft. is the only drilling well at present in the San Miguelito-Padre Canyon area. Continental is grading location for Grubb No. 23 and General Petroleum Corp. is preparing a site for Padre No. 5

Union Cores Orcutt Well

Coring at 5200 ft., Union Oil Co.'s Cal-Coast No. 19 is now one of the deepest wells ever drilled in the old Santa Maria-Orcutt field. Formation is reported as gray shale.

Located near the center of the south half of sec. 26, 9-34, the project is approximately 4600 ft. southerly from Union Oil Co.'s Squires No. 20 which was carried to 5094 ft. in 1938. Though some showings were reported near the 4800 ft. level, the Squires well was plugged to 4225 ft. and completed as a 75 bbl. pumper.

Union plans to drill two more wells in the old field, Squires No. 23 and Dome A-15.

Stokes Fishing In Glenray No. 1

After equipping the 90 ft. Glenray corehole with a light rotary outfit, L. E. Stokes is attempting to remove the old cable tool fish left in the hole when operations were suspended two years ago. Location of the test is in the southwest quarter of sec. 1, 4-26 in the hills back of the town of Summerland.

Tex Harvey Deepens Huasna Valley Well

With the let up in bad weather, "Tex" Harvey Oil Corp. resumed work on Gilmore Community No. 1 in sec 11, 32-14, Huasna Valley, and succeeded in recovering the liner from 4350 ft. It is planned to sidetrack the remainder to the old bottom at 4520 ft. and deepen in search of the Vaqueros.

The company's second well is standing idle at 2200 ft. after bailing tests of the fractured brown shale recovered a small quantity of heavy oil.

Engineering, Technology, latest news—twice a month in California Oil World.

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
	Santa Barbara County				
Goleta	Del Mar Oil Co., Rowe	1	11, 4-28		Rig
	San Luis Obispo County				
Huasna	Tex Harvey Oil Corp., Gilmore Comm.	1	11, 32-14	4518	Idle
	Tex Harvey Oil Corp., Gilmore Comm.	2	11, 32-14	2200	Idle
	Ventura County				
Bardsdale	Hopland Oil Co.	1	1, 3-19	985	Idle
	Fairfield, F. E., Bardsdale	1	12, 3-20		Location
Oxnard	Bender, E. A., Farrell	1A	5, 1-22	7005	Idle
Piru	Nelson, D. V., P.F.C.—C.H.	1	19, 4-18	1615	Drilling
	Havlin & Pottenger, Alice	1	33, 4-18	450	Drilling
	Oilexco, Inc., Newhall-Land	2	2, 3-18	570	Idle
	Oilexco, Inc., Stevens	1	34, 4-18	373	Idle
Sespe	Inter Counties Fuel Co.	1A	22, 4-19	510	Idle
	Riley, Irene Burson	1	19, 4-19	2050	Rig to deepen
	Signal Petroleum Co., Hadley	7	13, 4-19	2885	Idle
South Mountain	Comstock Pet. Co.	1	17, 3-29	1800	Idle
	South Mountain Oil Co.	1	10, 3-20	2622	Drilling
Timber Canyon	Fletcher, A.B., Timber Canyon	3	18, 4-20	1360	Idle
	Johnson, Chas, P., Jr.	1	24, 4-21	110	Idle

Late Basin and Valley

Deep Outlook Poor In Rosecrans Field

The outlook for deeper production at Rosecrans looks rather poor at present with Universal Consolidated Oil Co.'s 9350 ft. Trust No. 8 flowing 125 bbls. a day of 27.5 gravity oil cutting 10.0% and Union Oil's Rosecrans No. 45 swabbing on gas lift with a recovery of 120 bbls. of oil and 70 bbls. of water daily from 9618 ft.

Little further development is expected in the extreme south portion of the field where Royalty Service Corp.'s Stein No. 1, bottomed at 8002 ft. and plugged to 7915 ft., failed to flow and was completed pumping an estimated 200 bbls. a day with a 10.0% cut. St. Anthony Oil Corp.'s No. 7 is being rigged to pump after a long period of swabbing. The well is located at the northeast corner of Broadway and Redondo Beach Blvd. and is bottomed at 8077 ft.

Vitamin "J" for Oil Wells

Vitamin "J" is a powerful concentration of the experience of the world's oldest and largest exclusive manufacturer of pumping equipment. Its proper application cuts the cost of lifting oil, minimizes maintenance and improves the general health of any well.

Vitamin "J" is administered through the installation of a JENSEN Pumping Unit, which is easy and inexpensive. Thereafter production goes along more smoothly, the well requires less attention and you wonder why you didn't investigate the possibilities long ago.

For further information on this vital subject, wire us at Coffeyville or get in touch with our California representative . . .

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445 W. 6th, Downey, Calif.
Phone: Downey 47478

JENSEN BROTHERS MANUFACTURING CO.
Coffeyville, Kansas, U. S. A.

For detailed JENSEN JACK description and specifications, see . . . PRODUCING EQUIPMENT DIRECTORY or COMPOSITE CATALOG.

EXPORT OFFICE: 50 Church St., New York City

Jefferson Starts Inglewood Project

First to get under way since the completion of the Federal Oil Co. Smith No. 1 in the Inglewood deep zone will be Jefferson Oil Co. on the Ron C. Smith homesite. Derrick is up and equipment is being moved in.

The Federal well is yet flowing 500 bbls. a day through an 8/64 in. bean. Standard's deep test, L.A.I. No. 3-1 is coring below 9775 ft.

Standard Completes New Elk Hills Test

Near the center of sec. 29,30-24, Standard Oil Co. has completed No. 44-29S, a shallow job. Bottomed in silty gray sand at 3900 ft. the well was plugged back to 3232 ft. to try oil sands reported during drilling.

A string of 6 5/8 in. casing was cemented at 3185 ft. and 4¼ in. liner run to bottom. Completed on the pump, no word has yet leaked out concerning production.

Standard's deep test of the area, No. 42-31S in sec. 31,30-24, is reported at 7350 ft. in brown shale.

The company is also drilling No. 27-19S at 2500 ft. in sec. 19,30-24 and has rigged up No. 45-19S in the same section. Location has been surveyed for No. 42-33S in sec. 33,30-24.

2 Drill—2 Quit In Richgrove Area

A. J. Borget has resumed drilling on Kendall No. 1 in sec. 16, 25-27 of the Richgrove area in Kern County. Last reported at 1105 ft. the well is testing an undrilled fault block in search of Vedder zone production.

Located at the east side of the Valley where the beds are sharply rising, Vedder zone production is the well's objective. The wells drilled in this area have sought heavy oil production similar to that produced in 1938 by Dilamar Pet. Corp.'s Quinn No. 1 in sec. 15, 25-27 which did not prove commercial.

South of here in sec. 11, 26-27, Shell Oil Co. is drilling Smith No. 77-11 in search of typical east Valley production.

F. B. Copeland's Thomas No. 1 in sec. 15, 35-27 was put on the hook at 2822 ft. after finding the Vedder barren at 2801 ft. Drilling was done by Petex Drilling Co. and employed a new type of hydraulically erected portable drilling mast. According to W. R. Wells, president of Petex and designer of the mast, the new equipment works efficiently and will soon be offered to the trade for drilling and well servicing.

On the fringe of the Richgrove area in sec. 7, 25-28, White River Exploration Co.'s core hole, Salsa No. 1, was abandoned at 1610 ft. in extremely hard coarse sand.

Texas Co. Yet Bids on Cantua Acreage

Apparently undismayed by the poor showings made on formation test of the lower section of it's Cantua Creek wildcat, S.P. No. 27-13, The Texas Co. is reported upping it's bids on unleased acreage north of the well. Located in sec. 13, 17-15 of Fresno County, the well is the third drilled by the company in the immediate area. Fifteenth in the general section, the well seeks an overlaping condition in the Eocene horizon.

Bottomed at 9673 ft. in shale showing streaks of sand, the well found the Kreyenhagen shale at 7870 ft. and the Hondo section at 9075 ft. Due to the importance of the well to the company's operations in the area, little information has been released concerning the actual findings. It is generally believed however that good showings were found above the poor sands tested with bottom at 9506 ft. which recovered only thin mud and a trace of gas. A second test was made at present bottom but results are unknown.

This well is located a half mile northwest of the company's S.P. No. 1 which flowed a small amount of distillate, salt water and gas from the Eocene at 9413 ft.

Interest in the area has been maintained by all of the 14 previous tests which showed sand bodies and cuts enough to stimulate continued drilling. Best early showings were found during 1937 in Western Gulf Oil Co.'s S.P.L. No. 3 in sec. 3, 17-15. This well drilled to barren Eocene at 8531 ft. and plugged to Temblor sands at 6950 ft. to recover a small amount of 35.8 gravity oil.

Due to many sand bodies having been found in the area down to the Cretaceous below 12,000 ft., it is believed by many that a productive closure is one day certain to be found in the area. Prompted by the secrecy surrounding the sands cored in this well, plus the fact the best reported sands have not yet been tested and the fact that the company is still leasing in the area, it is suspected by some that this may be the long sought discovery.

Showing replacement parts department of H & B Sales Company, and members of the skilled organization which provides 24-hour service out of Long Beach. Reading from left to right they are: W. L. Mount, mechanic; B. H. Knowles, service man; Paul W. Carpenter, manager, service department, and Milt S. Lansing, office manager.

H. and B. Sales Stocks of Rig Parts Complete

What is said to be one of the most complete stocks of drilling rig parts maintained to serve operators in California is that of the H & B Sales Co., Long Beach, distributors of Wilson drilling rigs and hoists. Valued at approximately $30,000, the parts include such items as complete lined brake bands which are furnished on an exchange basis for old bands; complete replacements of water cooled drum flanges including the brake surface as well as the friction clutch surface; all sizes of roller bearing precision chain; V-belts for pump drives; oil filters and replacement packs and all additional replacement items. Parts are exact duplicates of those used in Wilson rigs and embody the same high quality of materials and workmanship.

"Although experience has shown us that Wilson drilling rigs require little servicing and that replacement parts are seldom needed," says Roy Hitchcock, president of H & B Sales Co., "we realize the importance of being able to render quick and expert service, and therefore maintain our complete stock of parts and our service organization made up of factory-trained men who are also engine mechanics as well. Our flat rate monthly check-up and service plan available at moderate cost keeps Wilson rigs running at highest efficiency. Our service experts also supervise installation and thoroughly instruct drillers."

Like Wilson drilling rigs, Wilson production hoists used by well servicing companies are said to give almost continuous service with practically no repairs.

Axelson Manufacturing Completes New Unit

Completion of the first step in the expansion plans of the Axelson Manufacturing Co. has just been announced by J. C. Axelson, president of the company. The first project finished has been the removal of the entire Engineering Department from the General Administration Building to a newly finished structure to be devoted entirely to Engineering Department operations.

This building, 35'x135', especially constructed to house the Engineering Department has the latest in designing rooms and equipment. The most up-to-date arrangement provides the latest in lighting, both natural and artificial.

The building has a working space of 4720 sq. ft. and will be known as the "Engineering Building."

"This expansion was necessary," said President Axelson, "to provide more office room in our general office building and to facilitate the expansion in our engineering personnel. This situation was brought about by the increased business in Axelson's pumps and lathes."

That is only part of the plant expansion program of this company now under way. Other units are fast approaching completion.

The company employs more than seven hundred and fifty men and has an investment in equipment equal to eleven thousand dollars per man.

Recent orders have established a new record of backlog of orders. Not only has domestic business greatly increased but in spite of war conditions the large foreign business which the company enjoys in all parts of the world is holding up far beyond expectations.

"Increasing business in both the Lathe and Pump and Rod Divisions of the company," said Mr. Axelson, "may make necessary a more rapid rate of expansion than we contemplated when our initial plans were drawn. Fortunately, we possess ample acreage on which more new buildings could be constructed, all directly tying into our present straight-line production system."

California Lands, Inc. Is Now Capital Company

California Lands, Inc., has been consolidated with Capital Co., and the name Capital Co. has been assigned to the consolidated company. President E. D. Woodruff requests that all correspondence formerly addressed to the California Lands, Inc. should in the future be addressed: Capital Co., California Lands Division, 785 Market St., San Francisco (or to the particular district office with which you are doing business.)

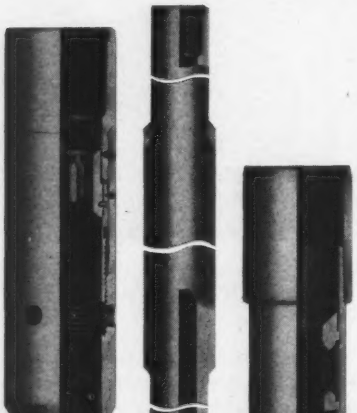
King Tate Recovering Following Operation

The many friends of King Tate, of Baker Oil Tools, Inc., will be glad to learn that he is recovering rapidly at his home in Maywood. King recently underwent an operation.

Security Engineering By-Pass Port Coupling

A new type by-pass port coupling, which, in conjunction with other equipment, makes it possible to set and hang a liner composed of a blank top section with a perforated lower section, and to "squeeze-cement" the liner above the perforations—in one trip into the hole—is now being marketed.

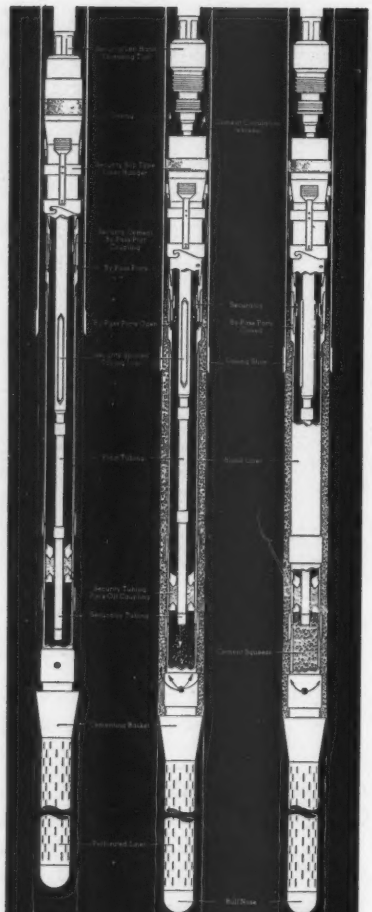
The complete by-pass port assembly consists of three principal parts, the by-pass port itself, which has closable by-



pass ports; the splined nipple which attaches to the tubing string, and is the means by which the ports are closed; and the pack-off coupling which forms a seal between the tailpipe and liner, so pressures can be extended outside the liner.

The by-pass port coupling consists essentially of an outer barrel or body threaded internally with a coarse right-hand square thread engaging a rotatable inner sleeve. The body is threaded at the upper end to fit the liner-hanger and at the lower end to fit the upper connection on the liner. The rotatable inner sleeve is restricted in downward movement within the body by means of a mutually engageable shoulder which, in conjunction with the neoprene packing rings, functions as a fluid seal for the by-pass ports located in the body immediately above the sealing shoulder. The inside diameter of this sleeve is the same as that of the liner. A drillable bushing is mounted within this sleeve and carries a number of longitudinal drillable keys or lugs facing inwardly and streamlined for unrestricted engagement with mating keys or splines mounted on the splined nipple.

For use in conjunction with steel liners and accessories, the coupling body is constructed of steel, while the splined bushing is made of drillable Securaloy,



3 stages in "Squeeze-cementing" operations using the Security By-pass Port Coupling Assembly

since this portion must later be removed when the liner is cleaned out.

In operation, the by-pass port coupling and the pack-off coupling which forms a seal between the tail-pipe and liner during cementing operations, are made up in the liner string as illustrated.

The cementing tail-pipe with the splined tubing joint properly positioned, is then placed into the liner, the releasing tool attached, and the complete assembly lowered into the well.

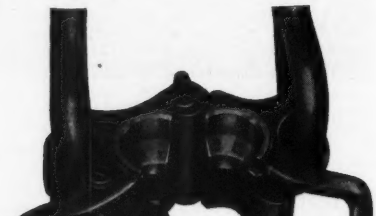
At the desired point, the liner-hanger slips are set in the usual manner, the packing expanded, and the releasing tool disengaged. Cement is then pumped down the run-in string, out the cementing collar, up the outside of the liner, and through the open by-pass ports to a point above the liner.

When it is desired to close the by-pass ports, the run-in string is simply raised a short distance, bringing the splined nipple into engagement with the rotatable sleeve, and rotated to the right, thus closing the ports. The tail-pipe extension remains packed off within the lower coupling and squeeze pressures can be applied if desired.

The internal structure of both the by-pass port and pack-off coupling is drillable, and when removed with a drilling bit during cleanout, leaves the internal diameter the same as the rest of the string.

Small External Upset Pipe BJ Center Latch Elevator

Byron Jackson Co. now manufactures a Light Type Center Latch Elevator for handling shorter strings of External Upset Drill Pipe used with portable rigs and in exploratory work where the working load does not exceed 20 tons. The BJ Type LG Elevator handles external



upset 18 degree taper drill pipe without the use of lifting plugs. The body of the elevator is made in two halves with a strong hinge pin in the back and a stirrup-type latch hinged to one of the halves of the Body, and so constructed as to distribute the shear. The other half of the Body has a large lug which the latch engages. On the Latch is mounted a Safety Latch which forms the handle for unlatching the elevator, and positively locks the elevator closed, safe from accidentally becoming unlatched due to a sudden jar.

Large loop-type operating handles permit easy opening and closing of the elevator; a third handle is placed on the rear of the elevator to permit faster, easier handling of the elevator by the floor men. The elevator is lubricated through a standard grease gun fitting on the rear of the body.

More complete information about the BJ Type LG Center Latch Elevator is available from Byron Jackson Co., P. O. Box 2017 Terminal Annex, Los Angeles, Calif.

A Roman news commentator said recently that there was little travel on the streets of the city. One reason may be that gasoline prices were posted at 95c a gallon.

New Type Portable Well Servicing Derrick

Is Rapidly Gaining in Favor

From an economic standpoint most operators now agree that there is much to be said in favor of the use of portable pulling equipment which includes not only the hoist and its prime mover but a mast as well. The question is largely one of the height of the mast.

Members of the production departments of the various oil companies have given several years of study to the problem of economically servicing deep wells, and the portable hoist with a mast 85 to 95 feet high is now regarded as a solution where wind, termites or other causes have necessitated removing the drilling or production derrick from the well site. Experience indicates that the mast requirements vary with the depth of the well. For instance, wells up to 2500 ft. in depth can be economically serviced with a 35-foot portable mast, which permits pulling and laying down rods and tubing in 30 foot singles. While 45-foot masts have been used for wells up to 4,000 feet in depth, the expense of handling the pipe or rods in 30 foot lengths makes a 60 to 65 foot mast which will permit racking 40 foot lengths of tubing (2 range-1 lengths) a necessary measure for economy. For servicing wells from 4,000 feet to 10,000 feet in depth, many operators believe they can justify portable equipment with an 85 to 90 foot derrick in which 60 foot stands of rods and tubing can be racked.

With the modern trend toward slim-hole drilling and shallow drilling with portable equipment, ample power in the hoist and a high mast become of vital importance, and operators now feel that many leases can be both drilled and serviced with the proper portable equipment more economically than by the old method of rigging permanent derricks for drilling and leaving them in place, or substituting production type-derricks for them.

Working together, Hopper Machine Works, International Derrick and Equipment Co., and Petroleum Equipment Co. have developed new heavy-duty portable equipment which employs a double drum, deep well hoist, 90-foot telescoping mast, and a prime mover, all mounted together on a special semi-trailer designed to be pulled by a four-wheel drive type truck. This equipment has been dubbed the "Blitzrig" by field men because of the speed with which it can be moved to the job and set up ready for operations.

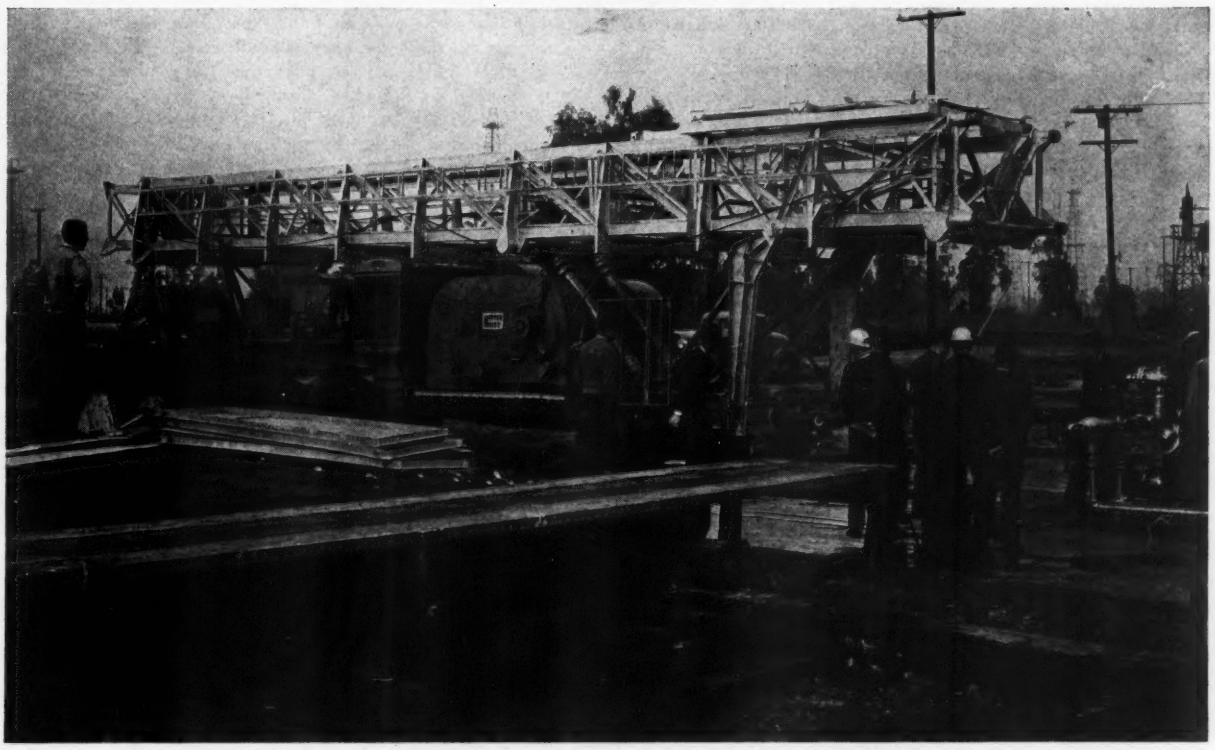
The outstanding feature of the "Blitzrig" is that it conforms to California highway regulations as to length, width, height and weight and can be transported over any state highway without a special permit.

Truck and Semi-Trailer Data

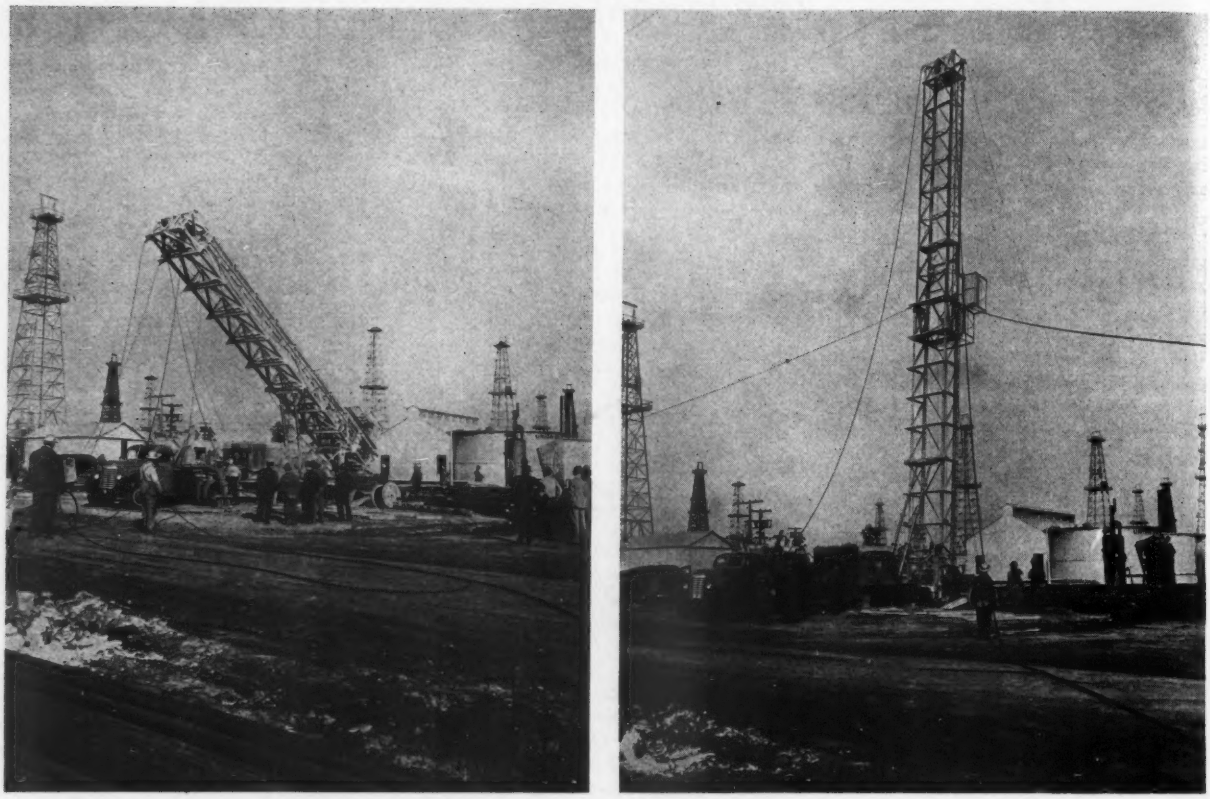
The semi-trailer is specially designed, constructed of electrically welded alloy steel and rigidly braced. Its dimensions are such that the mast, hydraulic jacks, hoist, prime mover, tower-erecting motor, winch, hydraulic pump, and all controls are mounted upon it. Levelling jacks are hinged to the semi-trailer frame, latches being provided to hold them up while the unit is in transit. Air brakes are provided on all the semi-trailer wheels, as well as on all of the wheels of the four-wheel drive type truck.

Hoist Data

The hoist is a Hopper Double Drum type, designated Model GF-GAKU. In addition to the hoisting drum it has an integrally mounted sand reel. Hopper Friction Cone Clutches are used on both drums. The hoisting drum has demountable cast alloy steel water-cooled brake



Sturdy compactness and simplicity of operation keynote the Blitzrig.



Left, the telescoped sections move into vertical position. Right, the upper section is being raised to final 90-ft. height.

rims and the brakes are equalized and compounded. The drum is free-spinning on roller bearings and the alloy steel drum shaft is roller bearing mounted. The sand reel, which has a line capacity of 11,270 feet of 9/16 inch line, is also roller bearing mounted and has double brakes. For operating the hoist and sand reel a Waukesha Model GAKU Engine developing 150 H.P. at 1800 RPM is used. This is employed as prime mover for the Hopper Hoist only, a separate motor being provided for the hydraulic pump and tower erecting winch.

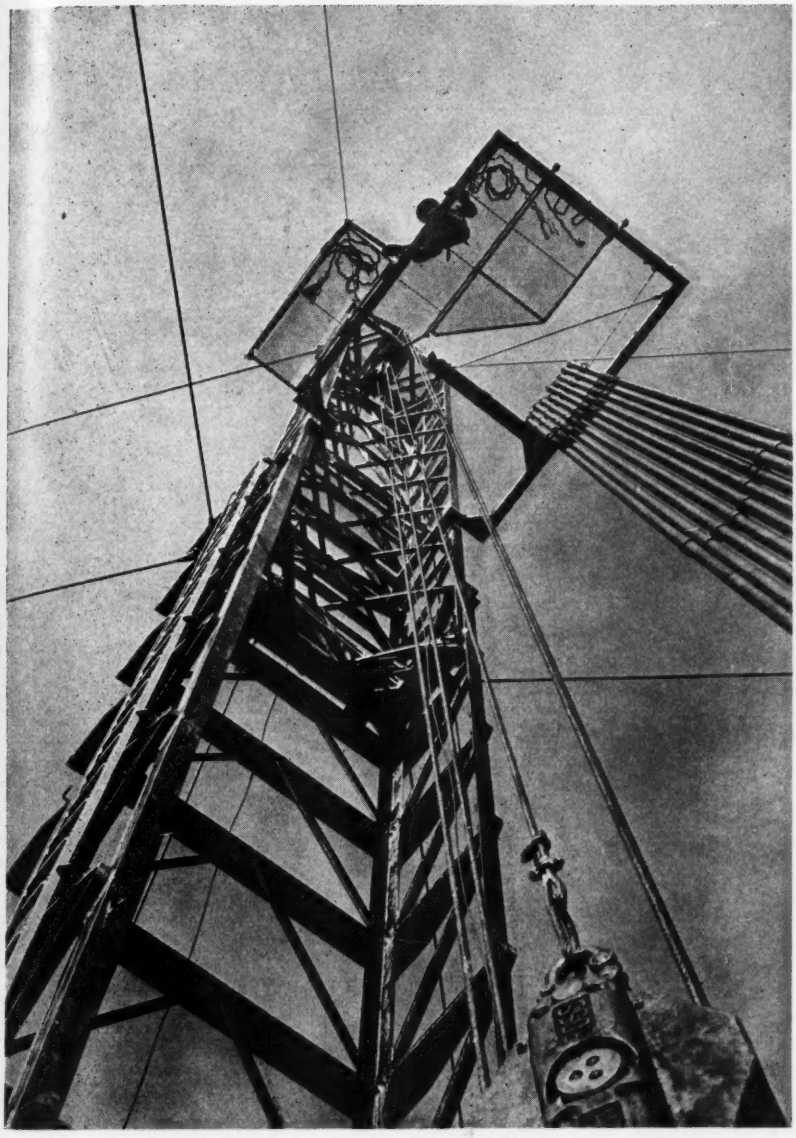
Mast Data

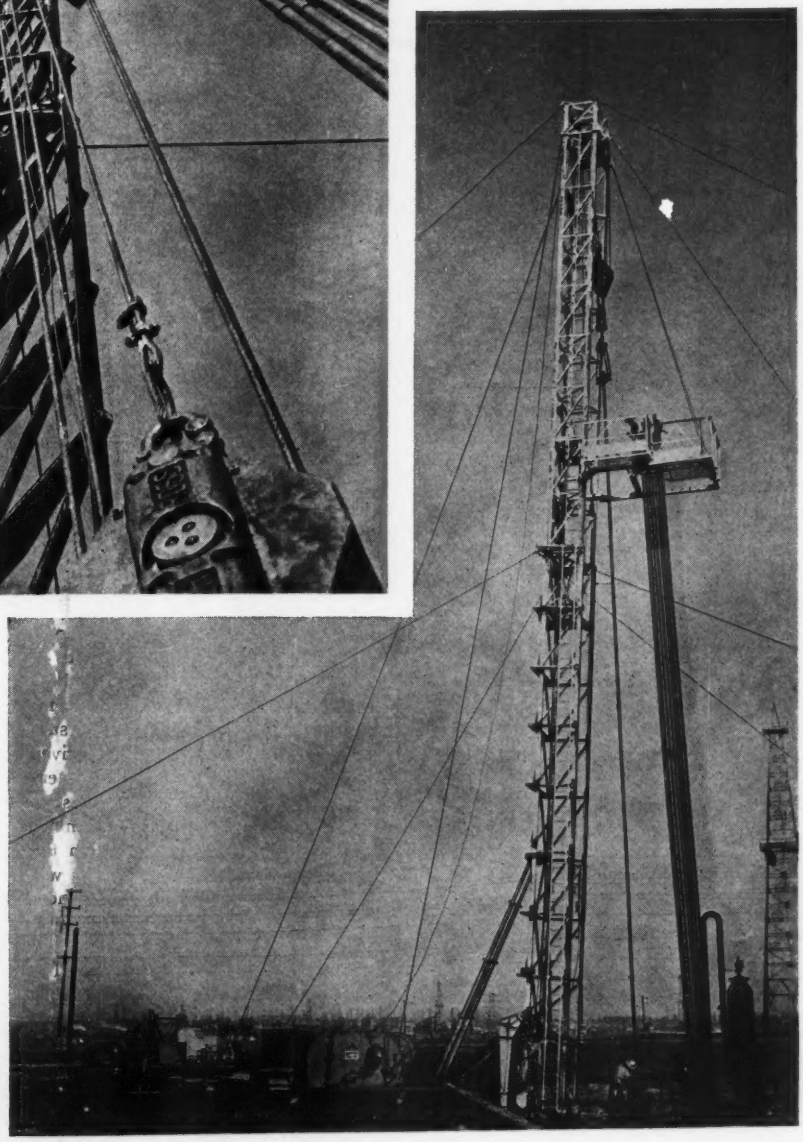
The IDECO Mast is made in two sections, the lower one reaching to a height of 49 ft. 6 inches when erected from the well, the upper section raising to a total height of 90 feet. The mast is of box-type construction with all four legs made of silicon angles of the same dimensions and held parallel for their full length. The structure is thoroughly braced for rigidity and welded throughout. No extra guide rails are necessary for telescoping the sections since the parallel leg angles serve as guides. A crown block assembly is integrally welded into the mast with the crown sheaves so spaced that the load in each leg, due to traveling block, guy lines and pipe set back is virtually equalized. A pull of 200,000 pounds on the traveling block can be safely sustained by the mast in the 90-foot position using 5 lines dead-ended on the becket. In the 49 foot 6 inch position the mast has a capacity of 300,000 pounds with 6 lines, the dead-end being anchored at the rear bottom of the mast for convenient attachment of the weight indicator.

Erection of the mast is easily accomplished and requires a minimum time. The mast is raised from horizontal to vertical position by means of two hydraulic jacks, pressure for which is supplied by a hydraulic pump V-belt driven from a 12 H.P. Waukesha air-cooled engine. The upper section of the mast is erected by means of a cable drawn by a winch which is chain-driven from the same Waukesha Engine. The winch will not operate in reverse except under power and is also equipped with automatic safety brake which takes hold instantly when power is released. The engine, winch, pump valves and complementary mechanism are mounted on one set of skids on the front end of the trailer. The spirit level mounted in a guarded position at the base of the mast indicates the proper tilt when the mast is in position so that the blocks are hung properly over the well. This facilitates erecting and positioning the mast so that the lower section can be raised from the truck, positioned over the well and locked from the operator's stand in 3 minutes, the top section can be elevated to full height in 4 minutes more, and the whole operation of erecting, positioning, locking and basing the mast by means of load carrying adjusting screws at the foot of each leg, all conform in not to exceed 10 minutes.

Guy wires are used at the top of the lower section and the top of the upper section. In practice these wires are cut to length for attaching to the dead men used for guying the drilling derrick which makes the job of guying quickly accomplished.

As mentioned before, the term "Blitz-rig" derives from the speedy set-up and operation of this Hopper-Ideco portable equipment. Inasmuch as it conforms to highway regulations it can be moved over state highways from lease to lease without permit and at regular traveling speeds. The traveling block is cradled in the open-faced mast and is already strung up. The guy wires are attached and coiled. The levelling jacks are hinged to the frame of the semi-trailer and can be placed in position and raised





Safety and dependability are indicated in these two views.

in minimum time. Actual operation in the field in pulling deep wells has demonstrated that the "Blitzrig" is outstanding in performance and permits all operations to be carried on without waste motion and lost time.

Of special importance to the production department which has the job of pulling rods and tubing on wells from 4,000 feet to 11,000 feet or more, as well as to the operator who wishes to use portable equipment for slim-hole and shallow drilling, is the pipe racking capacity of the "Blitzrig." The platform will accommodate behind the finger 13,000 feet of 2½ inch external upset tubing: 8700 feet of 3 inch external upset tubing; 3200 feet of 5-9/16 inch drill pipe; 4600 feet of 4½ inch drill pipe; 7000 feet of 3½ inch drill pipe; 10,000 feet of sucker rods, or 10,000 feet of 1¼ inch macaroni tubing.

The Hopper Hoist has been especially designed and powered to handle the heavy loads encountered in deep well servicing and slim-hole and shallow drilling with regular drill pipe, thus the "Blitzrig" offers virtually unlimited opportunity for economic operation under the widest range of circumstances.

The manufacturers emphasize the point that operation of the rig in well servicing requires no larger or more advanced crew than in a conventional rig.

Baash-Ross Acquires Job Shop Properties

Baash-Ross Tool Co. has purchased the general machine and contract job shop facilities and business of the Vernon Tool Co.

IDECO

"Kwik-Lift"

90-FOOT MAST

COMPLETE PORTABILITY AND FAST ERECTION PLUS 200,000 POUND LOAD CAPACITY

From the "over-the-road" position to 90 feet high "over-the-well" in ten minutes—that's the speedy erection you get with the Ideco "Kwik-Lift" telescoping mast. Powerful hydraulic jacks lift the mast from its cradle to the 49 feet 6 inches height and tilt it into correct position, where it is locked and the four load carrying screws in the leg bases are quickly adjusted. The upper section is then raised to the full 90-foot height by a steel cable and automatically locked against any possibility of falling. Guy wires are carried attached to the mast and ready for fastening to dead men, the traveling block is already strung up, and the platforms are hinged to the mast legs so that they can be pulled into position and locked in a few minutes.

Every factor of strength, safety, time-saving, and operating convenience has been planned, worked out in practice, and proved in actual service. The whole structure is rigidly braced and welded. In the 49-foot 6-inch position the mast has a load capacity of 300,000 pounds, and a capacity of 200,000 pounds when extended to 90 feet. Pipe racking capacity is: TUBING—13,000 feet 2½-inch external upset; 8,700 feet 3-inch external upset. DRILL PIPE—3,260 feet 5-9/16-inch; 4,600 feet 4½-inch; 7,000 feet 3½-inch.

Call your Ideco representative for full details.

"KWIK-LIFT" MASTS

Manufactured by

INTERNATIONAL DERRICK AND EQUIPMENT COMPANY

of California

TORRANCE CALIFORNIA

Left—Backed into position at the well. Note hydraulic cylinders.

Above—Raising mast from horizontal position.

Right Above—Mast at 49-ft. 6-in. position. Load capacity at this height is 300,000 pounds.

Right—Pulling full stands of tubing from a deep well. Speed, safety, and operating convenience are combined with real money-saving when using this modern equipment.